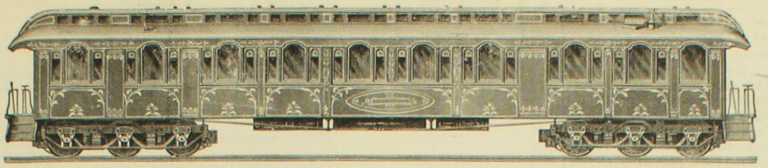
# NATIONAL CAR AND LOCOMOTIVE BUILDER.



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## Miscellaneous Items.

THE Baker Heater Co. have contracted to put the Perfected Baker Heater into fifty new cars of the New York Central & Hudson River Railroad.

THE New York Central & Hudson River Railroad Co. have ordered 50 new passenger cars, of which the Gilbert Car Manufacturing Co. will build 12, the Jackson & Sharp Co. 18, and the Barney & Smith Manufacturing Co. 20.

MR. M. L. HINMAN, Treasurer of the Brooks Locomotive Works, has been re elected Mayor of the city of Dunkirk, N. Y. His successful administration of the office during his first term is shown by the fact that at the recent election he received the support of all parties, no opposing candidate having been nominated or voted for.

IN connection with the Indianapolis shops of the Chicago, St. Louis & Pittsburgh Railroad, there is a very handsome detached building near the roundhouse for the accommodation of the engineers and firemen. Mr. Swanston, the master mechanic, keeps the rooms supplied with the leading railroad and mechanical papers.

THE Illinois Central Railroad Company are building in their shops at Chicago ten new mogul engines, with boilers 56 inches diameter and 211 flues 2 inches diameter. They are also getting out material for three new double-enders for suburban traffic. The Southern shops of the road are going to build four new switching engines of the standard pattern.

THE rolling-stock of the Elevated Railroads of New York will shortly be increased considerably. The roads are operated with a very small margin of cars and locomotives, and the recent increase of traffic has reduced the spare stock so much that inconvenience has been experienced in making repairs. New cars and locomotives of the standard pattern have been ordered.

THE Union Pacific Railway Company are having all the frogs and guard rails on the road filled with wooden packing, to prevent switchmen and yardmen from getting their feet caught. This is a very simple and inexpensive safeguard against a trap that yearly catches many victims, and it is most discreditable that so many railway corporations still decline to introduce this element of safety.

THE Indianapolis, Decatur & Springfield Railway Company are using the Eames automatic vacuum brake on all their passenger equipment, and the simple vacuum brake on all the drivers and tenders of their locomotives. The officers of the road speak very highly of the efficiency of the brake and of the small cost it entails for repairs. The passenger cars that go on to other roads are equipped with the Westinghouse automatic brake, as well as the automatic vacuum.

THE locomotives belonging to the Danish State Railways use a very flat brick arch in the fire-box. It extends up from the tube plate at an angle of about 30 degrees, and the top is level with the middle of the fire-box door opening. A supplementary arch extends from the top of the fire-door to the top of the main arch, the former acting as an air deflector. The main arch is only 4 inches thick. An American fireman would knock the whole structure down in about two hours.

IN the yard connected with the Cincinnati, Hamilton & Dayton road, at Lima, O., there is an old four-wheel locomotive that was the first engine used on the Cincinnati & Hamilton Railroad, which was chartered in 1846, and opened in 1848. The engine is carried by the four wheels connected, and has inclined cylinders, although there is no truck. The steam chest is on top of the cylinders as in modern locomotives, and the valve motion is the V hook. The engine is preserved as a curiosity.

A CORRESPONDENT, writing from Knoxville, Tenn., says: The East Tennessee, Virginia & Georgia railroad shops are busy getting their rolling-stock ready for the change of gauge that will be made throughout the whole system of Southern roads soon. The Knoxville Car-Wheel Company are running night and day on axle and machine work. They are turning out 100 wheels a day in the foundry, and are making arrangements to increase the output at once. The Southern Car Works are not doing much at present.

THE Burlington, Cedar Rapids & Northern Railway Company have recently built a handsome set of offices at Cedar Rapids, as clerical headquarters of the road. Mr. C. J. Ives, president of the road, has consented to provide Mr. R. W. Bushnell, the master mechanic, with a room in the building to be used as a class room for the apprentices and young men connected with the machine shops. Mr. Bushnell expects with the aid of his draftsman and Mr. Voss, foreman of the car shops, to give the boys a course of instruction in drafting and mechanical science.

THE question of disposing of the ashes, cinders and clinkers that are cleaned out of the locomotives at all large roundhouses with as little labor and expense as possible, has produced several ingenious ways of handling the refuse. At the Indianapolis shops of the Chicago, St. Louis & Pittsburgh Railway, they have what struck us as a very economical way of handling the cinders. The ash-pit is open, the rails being supported by pillars. Alongside of the pit track is a depressed track, into which cars are run to be loaded with the cinders. This brings the cars so low that the men shovel the cinders direct from the pit into the car, thus providing for only one handling.

MR. WM. VOSS, car shop foreman of the Burlington, Cedar Rapids & Northern Railway, has directed a great deal of intelligent attention to the wear of car wheels, and especially to the cutting of tire flanges. He keeps a book in which diagrams are made of the section of all tires that come in for turning. The two tires belonging to each axle are shown on opposite pages. A long and accurate record is thus preserved, and the identity of all the tires purchased is maintained. The teaching of this record has convinced Mr. Voss that almost the only cause of flange cutting is difference in the hardness of mated tires. He believes that in the case of chilled wheels, difference in size generally leads to flange cutting. Mr. Voss is a most intelligent car builder, a graduate of a German technological school, and a very expert draftsman.

THEY have a very economical system of handling coal at the coaling station of the Pan Handle Railroad shops at Indianapolis. The road coal cars are placed for unloading on a raised track, under which the coal dump cars can be run on short tracks set at right angles to the main track. When a dump car is got in under the road car, the coal is dropped by gravity through a hatch in the bottom of the latter car. The dump car, now loaded, is run out to a simple elevator and hoisted to the coaling platform, where it is weighed on scales provided for the purpose. A large quantity of coal is handled in this way by a couple of men. The system is well worth looking into by companies desirous of handling their coal with the least possible expense. We have no doubt but Mr. Swanston, the master mechanic, would supply details of the system to any one desirous of adopting it.

A MILWAUKEE railroad official is said to have invented a device for enabling the engineer of a locomotive to see ahead through the opaque clouds of a Wisconsin snow blizzard. The device consists of a sort of telescope that passes forward from the cab to the neighborhood of the smoke-stack. That may be a sufficient range of vision for Wisconsin railroading, but other regions call for a more extended view of the track. Most railroad men agree that there is no material tactical advantage gained in a storm by being able to see the smoke-stack. When the blizzard gets enterprising enough to take possession of the smoke-stack the engineer is seldom left long ignorant of the loss sustained. We never yet knew of an engineer sending the fireman forward to see if the stack was still there, so it looks as if the Milwaukee official is not destined to reap fame or fortune by his invention.

## Killing Cattle on the Track.

An exchange says:

Owners of cattle near railroad lines are frequently heard to complain that engineers, when animals are on the track, crowd on all steam and dash into the stock with apparent recklessness, as if the death and annihilation of the cattle was their sole aim and object. The fact is, that increasing the rate of speed of trains, when a collision with cattle is seen to be inevitable, is really a necessary measure to protect the lives of passengers and train employés, for the greater the speed of the train when the locomotive strikes a horse or cow on the track the less danger there is for the train or cars to be derailed. To avoid having his train thrown off the track, endangering the lives and limbs of the passengers intrusted to his care, as well as the property of his employers, the engineer, when he sights cattle on the track ahead, if he cannot check his train and slow down to a very low rate of speed, opens the throttle wide and gives the train all the impetus he can, hence the impression that he enjoys the sport of running down cattle. That the situation of an engineer in an emergency of this kind is anything but a pleasant one can be imagined. He shuts his eyes when the shock comes, for he knows not but that the next moment he may be mangled in the wreck of his engine, for he takes great risks when he runs into animated obstructions of this kind. The idea, therefore, that engineers enjoy running down cattle is preposterous, even laying aside the fact that locomotive engineers are known far and wide as a most humane, generous and manly set of men.

In spite of our contemporary's defense of the stock killing engineer, we still believe that a large proportion of stock killing is the result of pure recklessness. There may be rare cases where increasing the speed when cattle are on the track is the safer course, but during an experience of six years running on an unfenced road badly infested with cattle, we never happened to meet with a case where opening the throttle was safer than applying the brakes. We also believe, and most railroad officers will agree with us, that there are many engineers who enjoy the excitement of striking stock, and seeing the animals roll down the bank. Many cattle are unavoidably killed on unfenced roads, but the engineer who habitually does all in his power to avoid striking stock, is a much safer man to sit behind than the reckless dare-devil, who pitches headlong into any drove of cattle that strays on the track.

## Locomotive Cars.

Railroad operating in Trans-Caspian Russia is beset with difficulties unknown to other regions where railroads are used as a means of travel. A great portion of some roads are entirely waterless, there is no traffic except through traffic, and at certain seasons of the year the cold is intense, and the absence of local fuel supply renders heating and steam-making very expensive. To meet these untoward conditions, the Russian Government, which operates the railways, is having a special type of combined locomotive car built that carries enough water to run seventy miles. From the description we have seen, we believe the locomotive car is an enlargement of the American observation locomotive illustrated in the NATIONAL CAR-BUILDER of November, 1884, with modifications to suit the practice of Russian railways. There are six of these locomotive cars under construction at Kolomna. It is expected that owing to their lightness and compactness they will make the desert journey quicker, cheaper and more comfortably than the ordinary train. The exhaust steam will be used to heat the car, and the engine will have sufficient power to pull two freight cars, or a passenger car when necessary. We believe a tank car locomotive of this description could be used to good advantage on many of our branch roads where traffic is light.

## The Storm King Bridge.

It is said that a contract has been made with the Phœnix Bridge Co. for the building of this structure, and that the work will begin at once and be pushed to an early completion. The new bridge will be of the cantilever type, and its entire length about 4,000 feet. Two stone piers will be built in the river, one on each side of the main channel and 650 feet apart. These, with the subordinate piers, will sustain a triple cantilever, upon which there will be a single-track roadway 223 feet above the water. The depth of water in which the piers will be built ranges from 35 to 80 feet. The estimated cost of the structure, including 20 miles of railroad to connect it with the Erie road, is $6,000,000. The unbroken air-line route formed by a bridge across the Hudson, between the New England system of roads and the Pennsylvania coal fields, is expected to attract an immense coal traffic, and also reduce the cost of coal 50 cents a ton to eastern consumers. A large traffic is also expected in pig-iron, rails, etc.

## SHOP NOTES.

### Editorial Correspondence.

NORTHERN PACIFIC RAILROAD. MECHANICAL HEADQUARTERS AT ST. PAUL.

Any railroad man interested in mechanical matters is not likely to travel far into the Northwest, before being asked the question, Have you seen the new car shops that the Northern Pacific Railroad Company are putting up? For climatic reasons, we had kept away from the Northern Pacific territory during the winter, but we had got near enough to have that question directed at us repeatedly. The question came to be put in such a personally pitying style, as much as to say, "You have not seen much of railroad shops, any way, when you have not been at Como," that we could stand it no longer; so we started out, determined to see the new shops or freeze solid in the attempt. Mr. R. W. Bushnell shared our temerity.

On arriving at St. Paul, we found that the Como shops were overwhelmed by the greatness of the Northwest generally, and that the denizens of that region were so much occupied laudating the advantages of St. Paul, prophesying as to its future magnificence, and raving about the Ice Palace, that they had no time to descend into details that took in car shops. It is astonishing how quickly even strangers are seized with the "boom" fever when they get into the Northwest. We met Mr. Bailey, editor of the *American Machinist*, sojourning in St. Paul for his health, and he was as enthusiastic about its present advantages and future prospects as any of the natives.

Mr. George W. Cushing, Superintendent of Motive Power of the Northern Pacific Railroad, has his office in the handsome building recently erected as headquarters of the company at St. Paul. Mr. Cushing's office is notable for the numerous conveniences provided to show at a glance the condition and whereabouts of the rolling stock belonging to the company. One board is for locomotives. It has numbered pegs which give the number grade of engine and show the division or service it is employed upon. Encircling the peg is a ticket which shows by its shape the condition of the engine. A round tag means good order; a square tag means fair order, and a triangular tag indicates that the engine is getting worn out. One division of the board shows the numbers of the engines undergoing repairs and the shops they are in.

Other boards give similar particulars respecting passenger cars, the different varieties being distinguished by the color of the pegs. The way-car board distinguishes those having cupolas and speed recorders from the others. Speed recorders, by the way, are extensively used on this road. Trainmen call them Dutch clocks, and say they tend to make the trains go slow. Derricks, tool cars, piledrivers and steam shovels are recorded on a board, with particulars as to where they are located. Cars fitted with steel-tired wheels receive a special notice.

The information represented by the data on the rolling stock boards is obtained and digested from a most exhaustive and systematic system of monthly reports, sent in by master mechanics and master car-builders at all the points where cars or engines are running or get work done. These reports we will refer to at greater length in a future issue.

The Northern Pacific has 100 freight cars equipped with the Hein automatic coupler for trial. We are authorized to say that the report which has been circulated that this coupler has been adopted by the road as a standard is not true.

#### CAR SHOPS AT COMO.

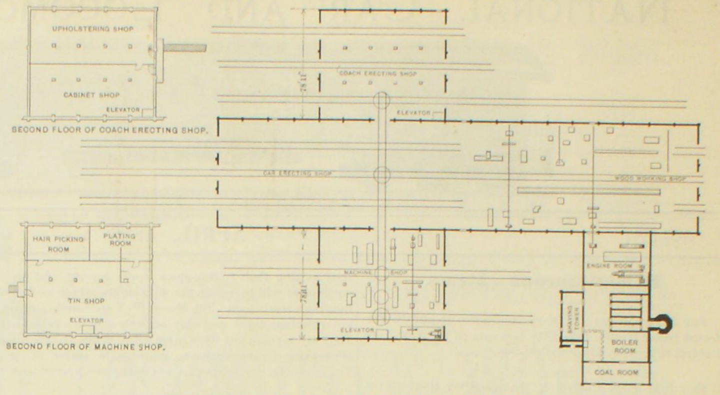
These shops are located on the highest point of land between St. Paul and Minneapolis, and are about midway between the two cities. The Northern Pacific Railroad Company purchased about 400 acres of ground where the shops are built, and the land will be held for future extensions of shops and yards. These shops are intended entirely for the repairing of passenger equipment. In an emergency cars can be built here, but that is not the purpose of the shops, although they are provided with the best of machinery and facilities for doing work cheaply. Mr. Cushing believes that contract shops, following the business regularly, are in a position to build rolling stock cheaper than railroad shops can, where new and old work has to be mixed up; so the company are not likely to try the expensive experiment of building new engines and cars.

The plan of the main shop building, with the location of the machinery, was designed by Mr. J. W. Kendrick, chief engineer of the road, and is so plainly shown in the annexed cut, that little description is necessary.

Mr. Cushing adopted what we regard as a very liberal and wise plan for deciding on the best arrangement of the machinery. He arranged the machinery and shafting in the drawing in the way that he and his assistants considered the most convenient; then he sent prints to the different makers of the machinery, and asked for any suggestions they might care to make as to its arrangement. This led to several modifications which Mr. Cushing considers improvements.

Detached from the main building is a so-called freight car repair shed, which is a substantial frame structure 70 × 320 feet. The intention is to use this building in winter for cleaning and washing passenger cars.

Alongside of the main shop, but not shown in the en-




Plan of Northern Pacific R. R. Car Shops, at Como, Minn.

graving, is the paint shop, a building 150 × 194 feet. Eight tracks traverse this building, and it is capable of accommodating sixteen cars. Like all the other shops, it is admirably lighted and heated. Steam heating is used exclusively in the shops, and they are lighted throughout by electricity.

The master car-builders' office and store-room is a two-story building 40 × 80 feet. At the end of the store-room a heavy crane is provided for handling material that has to be loaded or unloaded at this point. Besides the store-room, there are, in the form of detached buildings, a blacksmith shop 65 × 100 feet, a stock-house, oil-room and other small offices. The lavatories are got up in a particularly fine style, the men receiving every encouragement to maintain cleanly habits. The whole of the establishment is in very compact shape, and the handling of material will be reduced to a minimum. It will be seen that the main building is so arranged that it can be extended while maintaining the original plan. All the buildings except the freight-car sheds are built of brick, and most of them are one story high, special attention having been directed to the free admission of light through roof and sides. A great many special arrangements are made to secure comfort and provide against the searching winds that play around there in a terribly congealing mood during part of the year.

The whole of the machinery, tools and fittings for these shops were supplied by Manning, Maxwell & Moore, of New York, under contract; and Mr. Cushing regards the arrangement as highly satisfactory, and says it relieved the mechanical department of the road of much troublesome responsibility. The whole of the wood-working machinery was made by J. A. Fay & Co., of Cincinnati. The iron-working machinery was from various first-class shops. All the tools throughout these shops are set on foundations of masonry with a wooden lining above.

A small high-speed engine is placed in the tool room, and is used for running the iron-working machinery, the man in charge of the room looking after the engine.

A regular practice of the Northern Pacific Railroad shops is to true all the journals at the time tires are turned.

Mr. Cushing does not believe that any cast-iron wheels are round, and he is decidedly in favor of having them all ground before being put in service.

The jaws used for wheel boring will give six points of contact, which is regarded as a decided improvement.

They are not putting any more 42-inch wheels under cars belonging to this road. The tires of the large wheels are said to cut the flanges worse than those of the 33-inch wheels, but a 42-inch wheel tire does not get so many hard spots as the smaller tire. Heavier axles are required for the 42-inch wheels.

They have a gallows frame derrick at St. Paul for raising trucks off the wheels. The work of changing a pair of wheels is done very expeditiously.

The Como shops are not yet occupied by workmen, and Mr. Cushing does not intend putting them into service till every machine and tool is in running order.

#### ST. PAUL, MINNEAPOLIS & MANITOBA RAILWAY SHOPS.

These shops are located in the suburbs of St. Paul, and are quite modern in their arrangement and equipment, and they need to be so, for they are required to turn out a great deal of work. Work is very slack on the road at present, and about 25 per cent. of the engines are laid up, but they are very busy in the shops. They have thirteen engines in the machine shop and four in the boiler shop, which is a large percentage under repair of the 201 locomotives belonging to the road. They are compelled to use extremely bad water, which causes the boiler repairs to be very heavy.

Alongside each stall in the machine shop there is a movable platform which can be raised near the roof by means of tackle. When an engine has been stripped, the jacket and other parts that need no repairs are placed on this platform and hoisted out of the way, where they remain till it is time to put them on again. They have a very good tool room, which is placed in the middle of the shop. It contains a Brown & Sharpe milling machine, a small lathe, a slotter and a twist drill grinder. They have an attachment to the lathe for operating an emery wheel to grind reamers, etc. When a reamer gets too small they do not anneal it, but just put it in the lathe and grind it down to the next size. The emery wheel attaches to the tool-post of the lathe and is driven by a belt from a supplementary pulley overhead.

They have used steel pins very extensively on this road, but so many have broken in service that they are returning to the use of iron. We missed Mr. Downing, the master mechanic, during our brief visit to the shops, but were shown round by Mr. R. Wellisch, the general foreman, who is a very clear-headed mechanic.

#### MINNEAPOLIS & ST. LOUIS RAILWAY SHOPS.

During a brief sojourn in Minneapolis, we made several calls on railroad officers, but missed all except Mr. T. E. Clarke, General Superintendent of the Minneapolis & St. Louis Railway. Mr. Clarke is a very young man to fill the position he holds, but he is bright and well posted on all matters connected with his business. Mr. Clarke has a cupboard in his office where he keeps the leading railroad papers filed, and his conversation indicated that he was thoroughly posted on their contents. There were unmistakable indications about the roads that the General Superintendent was a live man, who would tolerate no careless practices and allow no waste of supplies.

The machine and car shops belonging to the road are located under the bluffs about two miles south of Minneapolis on the main line. Mr. G. F. Wilson, the master mechanic, is a young man with go-ahead ideas and no limit of energy. He keeps himself posted on all the advances of railroad mechanical science, and is ever ready to apply new discoveries and inventions to facilitate or improve his own work. Like other Northwestern roads, the Minneapolis & St. Louis is suffering from an unexpected collapse of business, and consequently there is not much doing in the shops. Mr. Wilson is a believer in the durability of steel for axles and pins, and uses it right along. He has not had any trouble with steel pins breaking, and thinks that bad forms have been used where steel did not prove durable or reliable. But he is not an advocate of steel promiscuously in machinery construction. He uses cast-iron cross-heads with a wrought iron double-headed bolt cast inside each wing. This arrangement is cheap and the cross-head never breaks. One which we examined had been running a year without the guides being closed, and there was no lost motion perceptible. Solid-headed cast-iron pistons are used extensively on this road and are highly spoken of. Grooves are turned on the periphery of the head to admit the rings, and these are sprung into place. This plan is followed very successfully with the small locomotives of the elevated railroads of New York, but this is the only instance where we have seen it adopted with large locomotives.

They drill their tube plates without first making a small hole for the large drill center. They just punch unusually large centers, and employ a special cutter, which is a tube moving on a solid bar whose under point is ground to a center and maintains its position in the punched center. Mr. Tongue, the general foreman of the shops, is an able mechanic, who takes an intelligent interest in aiding Mr. Wilson in his plans for improvement.

They have got a well-arranged blacksmith shop, and Mr. Mills, the foreman, displays an inclination to do his work in a mechanical way—not purely by brute force and stupidity, so often found rampant in this part of railroad mechanical establishments. All arrangements for cleaning and welding flues are grouped together in one part of the shop. The rattler is under the floor, and from it the flues are

passed up to the welding fire, beside which there is a cutting off machine. They use steel ends, and obtain very satisfactory service from them. It is generally asserted that steel ends are hard to weld and hard to keep tight, but no trouble under either head is experienced here.

The brass foundry is a model shop in its way. Ajax metal is used exclusively for bearings, and they are lined with a skin of antimonial metal which acts like a lead lining. The material is cheap and is easily handled, being cast on between a mold and the bearing.

Power is transmitted from the machine shop to the car shop by means of a wire rope ¾ in. diameter. The arrangement has been in use several years and gives no trouble. Mr. Christie, foreman of the car shops, is an ingenious mechanic. We were shown several labor-saving devices of his invention, among which was a very useful sash and door clamp. On a bench, a set of stationary and a set of movable iron heads are set parallel. By a simply operated foot-lever, the movable heads are advanced towards the stationary ones, and the door or sash being placed between the heads is squeezed together with whatever force the operator wishes to apply. Work is light in the car shops. They are putting new roofs and strengthening trusses on freight cars that were built too weak. They have a very neatly arranged car shop and planing mill, and every thing is kept in apple-pie order. This company have experienced so much trouble keeping the emergency tools in passenger cars, that Mr. Wilson is inclosing the kit in a glass case that has no door. The tools can be reached only by breaking the glass. They use copper wire for upper deck netting, and find it much more durable than iron or brass which had been used formerly.

They have got a good oil house detached from the main buildings. It has an iron floor and is entirely fire-proof. The oil is stored in tanks under the floor, from whence it is pumped up as required.

## Cincinnati Southern Railway Locomotives.

In answer to a letter asking for particulars of what he did in the way of locomotive building last year, Mr. Jas. Meehan, Superintendent of Motive Power and Machinery of the Cincinnati, New Orleans & Texas Pacific Railway, writes :

During the past year, the C., N. O. & T. P. Railway have built two first-class passenger engines of the following dimensions :

| | |
|---|---|
| Gauge, 5 ft. ; prepared for change to | 4 ft. 8½ in. |
| Wheels, No. of drivers | 4 |
| " " front truck | 4 |
| " distance between front and back drivers | 8 ft. 6 in. |
| Total wheel base | 22 ft. 6 in. |
| Weight on drivers | 60,000 lbs. |
| " truck | 30,000 " |
| Total weight on drivers and truck | 90,000 " |
| Diameter of driving wheels | 68 in. |
| " truck wheels | 30 " |
| " cylinders | 18 " |
| Stroke of cylinders | 24 " |
| Style of boiler | Wagon top |
| Outside diameter of smallest boiler ring | 54 in. |
| Size of grate | 70 × 32½ " |
| No. of tubes | 234 |
| Diameter of tubes | 2 in. |
| Length of tubes | 10 ft. 11¾ in. |
| Grate surface | 15 sq. ft. |
| Heating surface of fire-box | 127 " |
| " in tubes | 1,345 " |
| Total heating surface | 1,472 " |
| Exhaust nozzles | Double |
| Diameter of nozzles | 3½ in. |
| Size of steam port | 1¼ × 16 " |
| " exhaust port | 2½ × 16 " |
| Throw of eccentrics | 4½ " |
| Style of valve | Richardson-Allen |
| Outside lap of valve | ⅞ in. |
| Inside lap of valve | $\frac{1}{32}$ " |
| Lead of valve | $\frac{1}{64}$ " |
| " exhaust | ⅛ " |
| Size of main driving axle journal | 7½ diam. × $8\frac{9}{16}$ " |
| " back " " | 7½ " × $8\frac{9}{16}$ " |
| " truck " " | 5 × 8 " |
| Capacity of tank | 3,250 gal. |

These engines are running daily without any trouble on our fast passenger trains, pulling from six to nine cars over the C., N. O. & T. P. Ry., which has 6-degree curves and grades 60 feet to the mile. By reference to our time card, I find that to run 335 miles, the distance from Ludlow to Chattanooga, the time allowed, including all stops, is 9 hours and 25 minutes.

It will be seen from these figures that the mileage per hour is slightly greater than 35½, but from this should be deducted 16 stops. It is also frequently necessary to make up considerable delayed time, and on these trains this class of engines have made more than one hour. On this division considerable time is lost on account of the slowness in passing through tunnels and over bridges, of which we have 27 of the former and 140 of the latter.

The performance as regards fuel is from 50 to 55 pounds of coal per engine mile, and from 8½ to 9½ pounds per car mile. The engines are equipped with solid stub-end side rods and one of them, built by the Baldwin Locomotive Works, made a record of over 120,000 miles without having its rods down or being laid up for repairs during that time.

## Trial of Couplers.

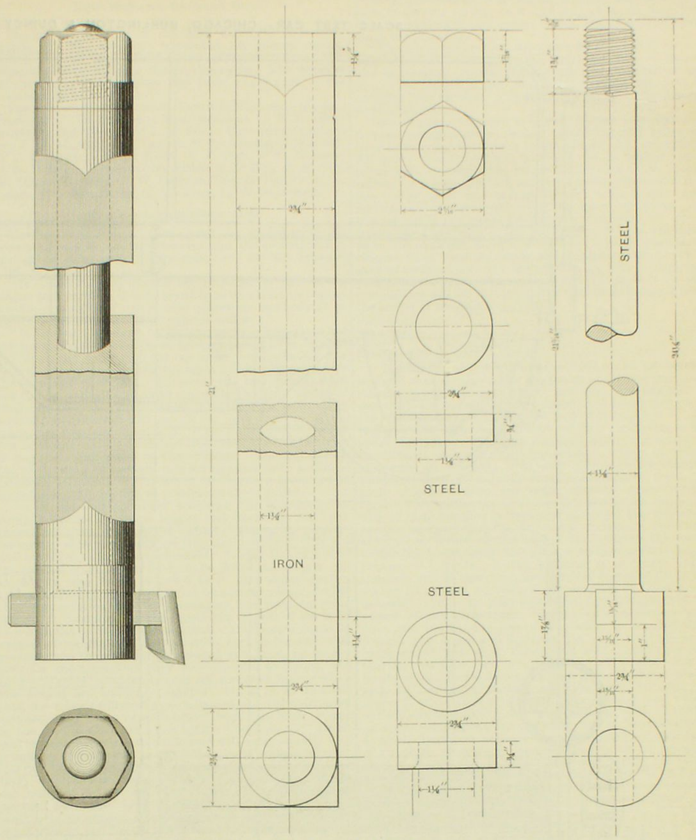
The roads to which the test cars equipped with the 12 couplers selected for favorable mention at Buffalo have been assigned for trial are as follows :

LINK COUPLERS.

New York, Lake Erie & Western, *Ames and Marks.*
Lehigh Valley, *Archer and Gifford.*
Delaware, Lackawanna & Western, *McKeen.*
Chicago, Burlington & Quincy, *Perry.*

VERTICAL PLANE COUPLERS.

Pennsylvania, *Cowell and Thurmond.*
Baltimore & Ohio, *Hien.*
Chesapeake & Ohio, *Titus & Bossinger.*
Chicago, Rock Island & Pacific, *Dowling.*
Chicago, Milwaukee & St. Paul, *Janney.*




Tool Post for Slotter.

The device shown in the cuts is the invention of Mr. F. J. Sedgwick, of the Indianapolis shops of the Pan Handle road. It is already in use in a great many shops, and is highly spoken of for its simplicity, convenience and durability. The device is so clearly represented in the cuts that no detailed description is necessary.

## Mahogany.

All the finest cars recently built have been finished inside with mahogany, and that wood is being largely used for ornamental work on the cars under construction. This is one of the whims of fashion, for only a few years ago our natural woods were by far the most popular material for inside finish.

Five years since, it is asserted, the imports of mahogany to this country amounted to only 500,000 feet annually. At present the volume of trade in this material is not less than 10,000,000 feet annually. A comparison of the figures will indicate the rapid growth of this wood in popularity. A short time since it was considered an expensive wood, but with the increased consumption its cost has been reduced, so that at present it is not much dearer than native walnut or cherry. Mahogany is not only fashionable wood, but it is the most reliable wood known to commerce. It is unequaled for doors, house-trimming, furniture, or for any purpose where a hardwood is desired.

It does not warp nor check; neither does the sun fade it, but, on the contary, it brings out its rich color. Time, which destroys other woods, only serves to increase the value of mahogany. An incident of its introduction into England early in the eighteenth century is worth relating:

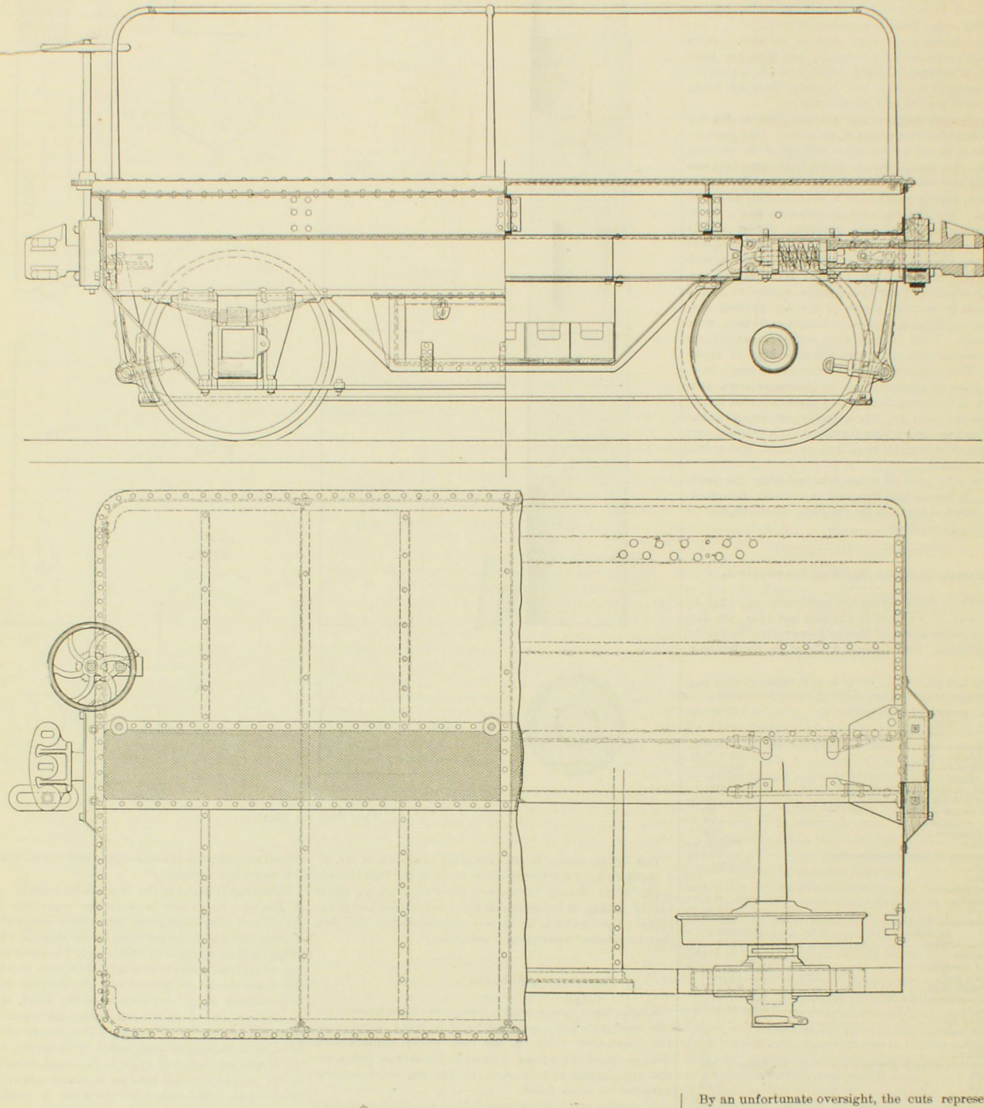
A west Indian captain brought a few planks to his brother, Dr. Gibbons, of London, who was erecting a house on King street, Covent Garden. The doctor knew something of wood, and instructed his master workman to use the planks in some of the interior work of his house. The workman said they were too hard, but the good doctor, having a cabinet-maker named Wallaston, turned to him and half jokingly asked if he could not make a candle box to adorn his library. The cabinet-maker, like some others of his craft, knew no such word as fail, and accordingly essayed the task. As the result of his skillful labor he brought the doctor a box the finish of which outshone all the other furniture. The fame of it grew, and, as a result, the permanence of mahogany as a fashionable wood was secured.

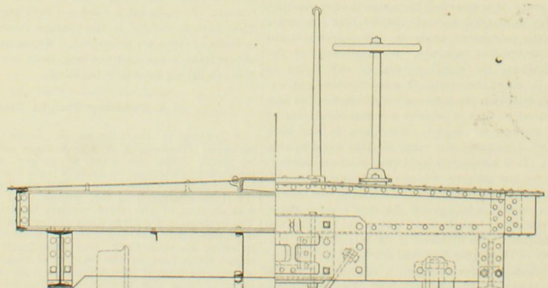
Mahogany is found in the West India Islands, and also in Mexico. Some time between the years 1521 and 1540 Cortes and his companions, after their conquest of that country, used it in the building of the ships in which they sailed on their voyages of discovery. The color of mahogany when freshly cut is of a light tone, and in finishing it this shade should be preserved. The finisher should not be permitted to use any stain upon the wood, as this detracts from its effect and interferes with one of the most beautiful operations of nature. The owner of a house finished in mahogany may notice from month to month the deepening shades of color in the wood, which mellow in the sun's rays and take on a richer glow. This increases year after year, until the wood is resplendent in beauty. To stain such wood is a vain attempt to improve upon nature, and by it the changes in shade and variety in tones of color are destroyed. Mahogany is unsurpassed as a cabinet wood and has long been used by the Government in fitting up public buildings.

## A Runaway Freight Train.

A portion of the city of St. Louis recently had a practical illustration of the damage and danger likely to result from the want of proper brake control of heavy freight trains. A freight train consisting of 62 cars heavily laden, while being pulled up Poplar street from the river, separated in the middle, and immediately the rear portion of the train started back down the grade. The brakemen did all in their power to arrest the progress of the runaway cars, but their efforts were unavailing, and in order to save their lives abandoned the train to its fate. Each foot of the backward course increased the speed, and almost immediately several of the cars began swaying from side to side, and soon several jumped the track, but still kept on in their downward course, crashing into the houses which line the streets, and leaving destruction in their wake. One of the cars became ditched, however, and this arrested the progress of those behind it. The others continued in their mad course, some off the track and some on, until they were toppled over into the river. Several houses on Poplar street, from Fifth street, where the two portions of the train became separated, to Second street were damaged, and almost every house from thence to the river was badly wrecked. By remarkable good fortune, no loss of life attended this alarming accident, but the destruction of property was very serious. The loss incurred by accidents of this kind would pay for a good many power brakes.

## SCALE TEST CAR—CHICAGO, BURLINGTON & QUINCY RAILROAD





By an unfortunate oversight, the cuts representing this car were inserted in our February issue without any accompanying description. They were also crowded out of the March number, and we now reinsert them with the necessary descriptive comment.

The car is a small one, and in its form resembles a platform car. It is designed for testing the correctness of scales upon which freight cars are weighed, and has been in use on the Chicago, Burlington & Quincy road more than a year, with very satisfactory results as to its adaptation to the purpose for which it was intended. It is 12 ft. 3 in. long, 8 ft. wide, and 3 ft. 11 in. high from rail to running-board. Its weight is 28,000 pounds, which includes 15,000 pounds of ballast and 3,000 pounds of test weights. As it is necessary that the weight should be subject to as little variation as possible from the absorption of moisture by wood, the car is built entirely of iron, with the exception of the buffer blocks and the floor upon which the test weights are carried. These weights consist of 60 U. S. standard 50-pound weights, and also a few smaller ones, all of which are carried in a cellar underneath the car, as shown, at the side of which they can be conveniently loaded or unloaded. The wheel base is 8 ft., and is made short so as to concentrate the weight upon any part of the track scales.

The pedestals are riveted to 10¼ in. I beams on each side, on top of which a continuous 7-in. channel beam extends around the sides and ends, with a top and bottom cover of sheet iron, forming a closed deck or receptacle of some 60 cubic feet capacity, which is filled wih old castings, and the intervening spaces packed tight with

iron borings to bring the car up to the requisite weight of 25,000 pounds, without the 3,000 pounds of test weights, thus enabling the scales to be tested for any intermediate weight.

The top of the car is the same height as a flat car, and on the top is a cast-iron running-board and hand-rail, as shown. The car is hauled at the rear of freight trains and in front of the way car.

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## The "Monarch" Parlor and Sleeping Cars—Luxury in Earnest.

The Monarch Palace Sleeping Car Co. have recently built a number of combined sleeping and parlor cars, so replete in luxurious finish and decoration, and every essential requirement for comfort and convenience, that the very climax of completeness may be said to have been reached. The length of these cars is from 64 to 68 feet, they have six-wheel trucks with 42-inch paper wheels, their cost is about $22,000 each, and their weight some 15,000 pounds less than the average weight of the ordinary sleepers. This economy in weight is quite an important matter, and in connection with the length of the cars and the heavy trucks upon which they are mounted, suggests some peculiarities in the construction of the car bodies that would be interesting to car-builders. Two of these cars are called, respectively, the "Zenobia" and "Cleopatra," names which are suggestive of oriental splendor and magnificence, and if the descriptive details given below are not exaggerated, the names are not misapplied. A writer in the *Buffalo Courier* describes the Zenobia (which is a parlor, dining and sleeping car all in one), as follows:

"The exterior of polished mahogany, on which is inscribed in gold letters the name Zenobia, is in keeping with the handsome interior. The scene presented on entering the car is one of oriental splendor, in which Persian tapestry, rugs of richest hues, finely upholstered revolving chairs and silk damask hangings harmonize well with the carved mahogany and deck lights of cathedral stained glass. The 24 revolving chairs, finished in Persian, are made so that each can readily be taken to pieces and comfortably stowed away under twenty double berths, each fitted with electric bell for calling the porter. On entering the car in the daytime one would never suspect that from each of the handsome mirrored cabinets that line both sides of the car, there could in a moment or two, by means of a lever, be made to evolve a comfortable double berth. But so it is; the attendant is able to conjure into existence from each cabinet a spacious berth measuring 6 × 5 feet, and separate hangings are provided for lower and upper compartments, thus securing privacy. The blankets of fine wool in variegated colors are, like every other article of furniture, adorned with the monogram of the corporation and its insignia in the form of a crown. At one end of the car is a handsomely fitted and well-furnished buffet communicating with a smoking room which has a table seated for a card party of six. The lavatory and other conveniences are fitted with all the most modern appliances. Indeed, everything from the silver-plated door handles to the superbly decorated maple ceiling is in the best taste. At the other extremity are convenient cupboards and lockers for the storage of Belfast linen cloths, towels, napkins, etc. Dinner tables for parties of two or three are neatly adjusted at a moment's notice, one table to each of the double French plate windows. For cooking purposes in summer there is capacity overhead for 1,000 pounds of ice. In winter the Baker system of heating with registers is in use. Howard lamps in clusters of fours depend from the ceiling, and an air of luxury pervades the whole interior."

The "Cleopatra" is thus described in the *Railway Review*:

"The outside is mahogany merely smoothed and varnished, and with age acquires the rich dark color of the old wood of that variety. On entering the door (by day) the usual state-room is encountered; also lavatory and toilet rooms of the most approved style. The main apartment contains 24 revolving chairs, very comfortable, and covered with Egyptian designs. Over each window is a small strip of stained glass, of antique pattern, and between each window a pier glass mirror, reaching nearly from the ceiling to the floor. Ample light is furnished by 21 silver-plated lamps, in quadruple, double and single burners. At the approach of night the arms and backs of the chairs are taken off and folded up. The bodies and pedestals are screwed down into recesses in the floor, and the car is cleared for the sleeping berths. Each of the mirrored panels between the windows now swings outward like an open door and form the partitions between the sections. From the interior of these all of the paraphernalia of upper and lower berths is brought forth and they are placed in position. The folded-up backs and arms of the chairs disappear under the lower berths, and separate curtains are then hung up for each bed. This is a great convenience, as a person climbing into either the upper or lower berth does not invade the privacy of the other. The berths are exceedingly comfortable, roomy, well ventilated and resplendent with mirrors, and possessing many convenient little nooks for the disposal of wearing apparel. The proper ventilation of the "Monarch" cars is brought about by causing all of the air to enter at the ends through a screened box. Through this the hot air from the heater comes in winter, and in summer the box is filled with ice. Electric bells for each berth or chair, rich tapestries to correspond with the car decorations, and rugs properly scattered about complete the interior."

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## A Link Block of Babbitt Metal.

During the war, Mr. Jacob Johann was master mechanic of a division of a railroad in Illinois that was chronically short of motive power, and he relates many curious incidents of the hardships they were put to in order to keep trains moving. He mentions the case of one engine that came in with one side, having lost the link block. It was a Lawrence engine, and the block was held by the head of the bolt. He had no tools to make a new block with, and no engine to take the place of that which was disabled, and the train had to leave within a few hours. Mr. Johann did not feel like giving in. He forged a bolt and made a mold the size of the lost block, fastened the bolt in its proper position, and filled the mold with Babbitt. The block thus formed was put in the link, and the engine took out her train on time. Mr. Johann merely intended the Babbitt block to run a trip or two, till he got an iron one made, but the engine just at that time went on to another division, and a year afterward he happened to see her, and found the Babbitt block was still in use.

## New England Railroad Club.

The annual meeting of the club was held in Boston, March 10. The secretary presented his annual report, which showed that the present membership was 159, being a gain of 46 over the previous year. The average attendance at the meetings had been 87 per cent. of the membership.

The following officers were elected for the ensuing year: President, J. W. Marden; Vice-President, J. N. Lauder; Secretary and Treasurer, J. M. Ford; Executive Committee, J. W. Marden, J. N. Lauder, F. D. Adams, O. Stewart, D. C. Richardson, John Kent, C. J. Post, F. C. Moseley, G. H. Billings; Finance Committee, S. D. Nye, F. M. Curtis, Osgood Bradley, F. W. Getman, George Buntin, H. L. Leach, F. S. Sherburne, G. W. Peck, C. W. Sherburne.

### SPRINGS FOR PASSENGER CARS.

The following paper on the question of reducing the weight of cars in passenger service and the adjustment of springs to light-weight cars was read by Mr. Edward Cliff, of Oswego, N. Y.:

"It comes directly within the province of the spring maker to determine if it be possible to so adjust springs to a reduced weight of our present passenger car body as to insure easy riding upon fast express trains.

"It is first necessary to determine to what extent the service of the present style of spring equipment is dependent upon the weight of the car body, and whether the present advantages or disadvantages will be augmented by the reduction of weight. Hitherto, the best combination is a full or half elliptic, built up with leaves or plates of steel, and used in connection with spiral coils technically termed "equalizers." In service the imperfections of the track are first communicated to the equalizers, in which the motion is wholly or in part absorbed, and the balance, if any, communicated to the elliptics. The equalizers, therefore, are first brought into service and their action is constant, so that it is important to improve them, so to transfer as little motion as possible to the elliptics.

"A single coil equalizer possesses the advantage of being a spring of large height and diameter, for upon these conditions depends the nature of the spring motion, becoming slow and easy as they are increased, or quick and sensitive as they are decreased. Taking the weight of the present style of car body to be 32,000 lbs., single coil equalizers may be so adjusted as to give almost perfect riding to the car when light, but by adding a load of 8,000 lbs., representing but 53 passengers, the total carrying weight is increased by one-fourth the weight of the body to which the springs were adjusted. This proportional increase of weight is so great that the springs become compressed, and their motion so reduced as to leave no proper play for the vibrations they are expected to absorb, and they will close completely at every severe shock, or when the brakes are suddenly applied. If, in order to avoid this, we adjust the springs to a loaded car, the coils must necessarily be made of such heavy bars that their action is too stiff for the car when light. Consequently, single coil equalizers cannot be made that will carry equally well a light or a loaded car, as the difference in weight between the two being at the lowest estimate one-fourth that of the body, is beyond the range of easy spring motion. If the car body is to be reduced to, say, 24,000 lbs., and we assume the same load of 8,000 lbs., the proportional weight to be carried is increased from one-fourth to one-third, and as one-fourth is too large to insure easy riding, the present disadvantages will be increased.

"With the present weight of car body, if, in order to increase the power we use a two or three coil equalizer, another and a serious disadvantage presents itself; for being of the same height and consequently compressed to the same extent, the sensitive nature of the inner coils will control the action of the spring as a whole, and we lose thereby the soft, easy motion of the large outside coil. The coils fit closely within each other, and are nearly of the same capacity, which in itself is a great objection, in addition to the unavoidable friction between the coils. An equalizer in very general use is composed of coils made from $1\frac{1}{16}$ in., $\frac{7}{8}$ in. and $\frac{11}{16}$ in. bars, and with capacities respectively of 4,000, 4,000 and 3,000 lbs. The aggregate of power in the inner coils is nearly double that of the outside coil, and hence its easy motion is almost entirely lost, and the sensitive nature of the two small coils is imparted to the equalizer.

"The question presents itself then, 'Is it possible to so construct an equalizer that it may be perfectly adjusted to a car when light, and then gradually receive a reinforcement of strength as the load is increased, and still preserve the easy nature of the largest coil?'

"I believe it is not only possible to make such a combination for our present weight of car body so that it may ride equally well, light or loaded; but in such a combination it is also possible to make it carry equally well a reduced weight of body and still preserve in the spring the desired range of easy motion to meet the varying passenger weight. In order to preserve the advantages of the single coil, it is only necessary to adjust the outside coil of our equalizer to carry the car body light, and then shorten the inner coils, so that they may remain at rest until the outer coil requires a reinforcement of strength at two successive stages of its compression. In order that this additional power may meet the exigencies of the case, it becomes necessary to use varying sizes of bars, and coiled with varying diameters. This becomes possible, as each coil may be held independently of the other two by a combination of malleable iron plates, which also furnish the bearings for the graduation. At least $\frac{1}{4}$ in. space is thus obtained between the coils, and all friction is thereby eliminated. In the plain coil equalizer already referred to, the bars were $1\frac{1}{16}$ in., $\frac{7}{8}$ in. and $\frac{11}{16}$ in. for the coils, with capacities respectively of 4,000, 4,000 and 3,000 lbs., making an aggregate of 11,000 lbs. By using in a graduated equalizer $1\frac{1}{4}$ in., $\frac{7}{8}$ in. and $\frac{1}{2}$ in. bar coils, we obtain capacities of 7,000, 3,000 and 1,500 lbs., with an aggregate of 11,500 lbs. Through the use of such a combination of capacities and allowing $1\frac{1}{4}$ in. of independent motion to the outer coil and 1 in. between the second and third, we preserve in the equalizer the nature of the coil of largest diameter, for even when the combination is entirely compressed the power absorbed in the largest exceeds the combined power of the other two by 2,500 lbs.

"Should it become desirable to reduce the weight of the car body from its present standard, it will necessitate simply a reduced size of bar in the outside coil of this improved equalizer, in order to carry the lighter body, as we still preserve in the graduated power sufficient range to meet the requirements of the varying load. The principle of graduation is of the highest importance in any style of bearing spring, as it not only gives to both passenger and freight cars easier riding, but it actually prolongs the life of the car.

"Having attempted to show how it is possible to not only adjust an equalizer to the varying nature of its service in carrying weight, but also to any practical reduction in the weight of the car body, I would ask you to consider how far such a reduction will affect the present style of elliptics.

"An elliptic is expected to absorb motion transferred to it from the equalizer; so that in improving the latter we have less motion to transfer to the elliptic for absorption. All heavy vibrations must, however, be in part so communicated, and should be controlled in order to obtain easy riding. An elliptic which entirely absorbs vibrations at a low rate of speed and carries the car with a soft, easy motion, will become rigid when the speed increases, and will impart to the car a continuous succession of quick, tremulous vibrations. The reason for this is apparent. Take, for example, an ordinary 36 in. 5 plate quadruplet elliptic, 12 in. over the bands and composed of leaves of steel of rectangular cross section 3 in. by $\frac{3}{8}$ in. Compress such a spring to its extreme limit and the ends of the separate plates will move through the following distances from the center of the bands:

| | |
|---|---|
| First or top plate | $\frac{2}{32}$ in. |
| Second plate | $\frac{3}{32}$ " |
| Third " | $\frac{4}{32}$ " |
| Fourth " | $\frac{5}{32}$ " |

"The leaves of this spring have 2,274 sq. in. of bearing surface, and consequently the factor of friction in a plate elliptic spring is of very great moment. Its presence is not only the most desirable cause of the easy motion of the springs in service at a low rate of speed, but it also becomes the objectional cause of their rigid state as the speed increases. This is a practical truth very easily demonstrated, by using single bar elliptics, which, of course, eliminate all friction. The easy riding motion becomes unpleasantly lively directly the speed increases, while the plate elliptics, under the same circumstances, become rigid. This difference is wholly due to friction, for in the case of plate elliptics as the speed increased the vibrations became so rapid that the frictional resistance prevented absorption, while in the single bar elliptic the quick vibrations accelerated the spring motion and the elliptic became too lively. Either extreme is, of course, objectionable, and it, therefore, becomes the object of the spring maker to govern or reduce the amount of friction to a desirable point. In order to do this, and still preserve the power of the rectangular bar, it is only necessary to reduce the bearing surfaces of the plates, by beveling them toward the edges and tapering the ends approaching in cross-section the oval form, but still preserving any bearing surface we may desire. We find this to be about two-thirds of the amount in rectangular plates, and, as another advantage resulting from beveling the plates to effect such an end, we have reduced the weight of the finished elliptic from 8 to 10 per cent., with, of course, an appreciable saving in cost. The use of beveled plates, as above described, enables the present limit of thickness of the plate of rectangular cross-section to be increased from $\frac{11}{32}$ in. or $\frac{12}{32}$ in. to $\frac{13}{32}$ in., and consequently we obtain greater power for heavier car bodies without the addition of an extra plate. This is a very valuable consideration, as we can again reduce friction by using fewer plates and still preserve a good bearing surface between the plates by not being required to increase the bevel. It is possible to obtain the same power in such a 4 plate $\frac{13}{32}$ in. bar elliptic as is at present obtained in the New York Central standard 5 plate $\frac{12}{32}$ in. bar. The latter spring is 12 in. high at rest, while the improved elliptic would be but $11\frac{1}{2}$ in., thus starting the spring motion with the same ultimate power nearer a straight line, which insures easier riding. Having entire control of the friction in this improved style of spring, it becomes merely a question of experiment to determine its desirable factor in the various styles of cars.

"The foregoing principles of spring motion, as applied in the construction of the springs I have attempted to describe, will apply equally well, I believe, to any practical increase or decrease in weight it may become desirable to make in the car body."

The following letter from Mr. H. Stanley Goodwin, Superintendent of the Lehigh Valley Railroad, was then read:

"I am in favor of reducing the weight of cars in passenger service provided it can be done without sacrifice of strength or any other desirable feature. I do not see, however, how this can be done. I consider it possible to adjust the springs to light-weight cars so as to give easy riding cars on a fast express train. We succeed in doing this so as to fill the requirements entirely and experience no difficulty in so doing. The weight of our standard Eastlake car with fifteen windows on each side is as follows:

| | |
|---|---|
| Body | 27,888 lbs. |
| Trucks | 17,248 lbs. |
| Total complete | 45,136 lbs. |

"We consider the form and proportions correct and desirable, and in consequence we would recommend these weights for body and trucks."

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## Master Car-Builders' Club.

The monthly meeting was held on Thursday evening, March 18, at the rooms of the Club, 113 Liberty street, New York. The president, Mr. L. Garey, being absent, the meeting was called to order by the secretary, Mr. C. A. Smith. After expressing his regret at the small attendance, Mr. Smith said he had received a number of questions from various parties which he would read. The first question was as follows:

"Why are the ends of box freight cars constructed without sufficient strength to stand the resistance of shifting bulk, such as grain, lumber, etc., without pushing the end of the car out in case of a sudden stop?"

Mr. Smith: I think one of the men who have spoken most decidedly about this is our president. The great trouble that roads have is in the knocking out of the ends of the cars by sudden concussion. That was one of the great objections he had to carrying larger loads in cars. The larger the loads, the harder the bump would be. Is there any way that this can be remedied?

Mr. Creamer: It is the first time I knew there was a defect of that kind. I supposed if that defect had been known, it would have been overcome by making the end timbers stronger.

Mr. Forney: I should think the cross pieces should be trussed. There ought to be a tension rod in the end.

A model of a standard car of the New York Central road was then exhibited, and a rambling discussion ensued as to the various ways of strengthening the ends of cars, but which requires a drawing to make clear.

Mr. Bosdevex, of the Pennsylvania road: I will say one thing about our cars. I think the frames are all too light. The frame is made lighter even in the weakest place by notching and cutting it. I always believed in a good pillar on a car, a good side sill and a good top rail. Then you have got about all you can get in it. I think the cause of most of the cars breaking out at the ends is owing to the weakness and the way the timbers are cut away. It is a good problem, How are you going to strengthen them without making an ungainly sight of it, unless you make the cross pieces a great deal heavier? I would suggest that the nailing piece be not cut over. I think the cross pieces ought to be heavier than the corner posts.

Mr. Smith: Is not the question of end sills on the outside of the car one that has recently been raised?

Mr. Forney: Yes. Comparative merits of the end sill being put on the outside of the car.

Mr. Bosdevex: Some cars have the end sill and side so constructed that the water will run down between the siding and the piece put over the end sill, and eventually rots it out.

Mr. Smith: Could not that end sill be put out far enough? Could not that be brought down and leave a little space, say the thickness of an inch between the sill and the sheathing?

Mr. Forney: Which of the end sticks usually break?

Mr. Bosdevex: The two intermediates usually split out at the bottom, tearing out the mortise.

Mr. Forney: I think that could be remedied by a diagonal rod under the floor.

Mr. Bosdevex: You might tie it. but the tenon does not go in far enough to do any good.

Mr. Forney: I think a good plan would be to truss the top.

Mr. Smith read the next question, as follows: "What would be the maximum wear and the greatest mileage a $3\frac{3}{4} \times 7$-inch steel journal should make under 40,000 pounds capacity car with safety?"

Mr. H. A. Little: "It would depend a little on what it was made of and what kind of a track there was.

Mr. Smith: "At the Boston Club meeting a month ago (although they did not reach it) they had up the matter of a three-truck car and they sent out circulars. I answered one, and a man in Arkansas who saw my published reply, writes as follows:

"Noticing Mr. C. A. Smith's sarcastic reply to the New England Club, I suggest this subject to your club, hoping that its members will inform themselves of the practical results developed in working the three-truck cars on the roads referred to. I think Mr. Smith's sarcasm is founded on theoretic rather than his practical knowledge of the workings of this new system of car equipment. Theory in mechanics only learns us to speculate, while practice demonstrates the right or wrong of that speculation. Hence I would suggest that your club inform itself by asking the officers in charge of the car departments and traffic of the following roads, the result of the practical working of these cars. The Little Rock & Fort Smith, Pennsylvania Company, Pittsburgh, Fort Wayne & Chicago, Vandalia Line and the Iron Mountain & Southern. These roads are working this system of car in hauling their 60,000 pounds load daily over their roads. I will conclude by saying to Mr. Smith that perhaps Horace Greeley's advice to "go West" would do him good.

Mr. Smith: I decline to go. I never took much stock in Horace Greeley's saying, so I shall not go West on account of the three-truck question.

Mr. Creamer: Does that mean three trucks for all cars?

Mr. Bosdevex: How did they manage in getting over curves?

Mr. Little: They slid over.

Mr. Smith: What the advantage of a three-truck car is I fail to see. The two-truck car, with a journal large enough, will always carry the load safely. You can make wheels good enough to carry a load of say 30 tons or a little over. safely, and what is the use of the three-truck business?

Mr. Bosdevex: I think it would wear the curves more. That would suggest itself to me.

Mr. Creamer: What started the idea of these three trucks?

Mr. Smith: They have been advocating it for several years. I do not know that any road has adopted them for general use. Can you see any advantage in them, Mr. Forney?

Mr. Forney: They support the weight of the center, and the body need not be so strong. It seems to me, however, there would be great difficulty in equalizing the weight.

Mr. Smith: Even if it could be done, what is the necessity for building the three truck car when two will carry all that is wanted? Roads are now building 25 to 30-ton cars just as safely with two trucks as with lighter ones. We are running in the Tank Line 28-ton cars where we used to use 10 and 12-ton cars. They are built on the Master Car-Builders' standard axle, and they are just as safe as the old 10-ton cars.

Mr. Smith read the next three questions, as follows:

"How much slack is necessary and desirable for the proper handling of freight cars of to-day? I refer to the swinging head style of the Janney family. We have recently patented a new coupler of that style, and we have $1\frac{1}{4}$ inches slack."

"How much slack should there be between the draw-bars to each car to start heavy trains?"

"What should be the slack between the draw-bars of freight cars to start heavily loaded trains?"

Mr. Bosdevex: I would allow about $2\frac{1}{2}$ inches; just enough to couple easily.

Mr. Hackett: By using a link you would get a good slack.

Mr. Smith: When the Miller hook was first used, engineers used to growl about the starting of the trains, but they soon got over it.

Mr. Bosdevex: The Janney has a spring, but the question is whether that spring is sufficient.

Mr. Smith: A man from Toronto asks:

"Do all railways in the States use the same signals, viz., tail lamps, buffer lamps, switch lamps and semaphores? Here in Canada they are adopting uniform signals."

Mr. Smith: This is hardly a question for discussion, and we will pass to the next, which is in the form of a resolution, as follows:

"*Resolved*, That an automatic freight car coupler should be universally adopted."

Mr. Forney: I move that we won't do it.

Mr. Smith read the next question:

"What should be the leverage of freight car brake levers with brakes on only one truck, with a 14-inch brake wheel and shaft $1\frac{1}{4}$ inches in diameter?"

Mr. Smith: I believe that the leverage on freight cars is altogether too great. There are more wheels flatted by sliding than any railroad company would acknowledge or would want the world to know. They are flatted by having too much leverage on the brake levers.

Mr. Forney: The brake ought to be regulated so you could bring a pressure upon the wheel when the car is loaded, equal to that which you would use on the wheel if the car was light.

Mr. Smith: I believe it is estimated that a man on a 14-inch wheel with a $1\frac{1}{4}$ inch shaft will pull 2,000 pounds on the chain brake connecting rod. A great many will put on 3,000. I remember I was at the Brooks Locomotive Works, in Dunkirk, and I tried a contrivance Mr. Brooks had there for testing the strength of a man in putting on brakes. I pulled 1,200 pounds, but I do not call myself a strong man. Mr. Brooks was able to pull 3,000.

Mr. Creamer: I rigged a contrivance for the same purpose. I found there was a vast difference in the capacity of the men who applied the brakes. Some men comparatively small would exert a tremendous strain on the wheels. They were experienced in the use of the strength. If you are going to make any change in the size of the levers, I would say adjust the size so that you cannot slide the wheels at all with a light car.

Mr. Smith read the next question: "Should a brakeman be allowed to use a club in operating brakes on freight cars?"

Mr. Little: It occurs to me to say that we are getting up a brake beam, concave, with which it will be impossible to slide the wheels. It will equalize the weight. It is designed to do away with all the other evils.

Mr. Smith read this question: "Is the car body or the truck the best place to hang brakes to, and between or outside of wheels?"

Mr. Forney: You pays your money and you takes your choice.

Mr. Smith: I will now read some additional questions: "Should car axles and journals be enlarged from the M. C. B. standard for cars of more than 40,000 pounds capacity, and if so, how much?"

"Can a poorer dust-guard be made than the one generally used in the M. C. B. standard box?"

"Which would make the easier riding coach—one with rubber or steel coil springs on the equalizing bars?"

"Does the usual method of building the ordinary diamond truck insure accurate parallel axles? If not, how can it be done?

"Should brakes be applied to all the wheels of freight cars?"

"Should the centers of day-coach seats be placed at centers of windows?"

The above questions were not discussed, owing to the lateness of the hour.

## Car-Wheel Irons.

At the Pittsburgh meeting of the American Institute of Mining Engineers, after the paper of Dr. C. B. Dudley, relating to car-wheel irons, had been read, Mr. E. Ford, chemist at the Edgar Thomson works, spoke as follows on the subject:

MR. PRESIDENT: Dr. Dudley's remarks on certain probable combination of the metalloids and the metals in pig irons and steels recalls very forcible to my mind some experiments which I made some seven or eight years ago on the chilling properties of cold-blast irons and the wearing properties of chilled cast-iron car wheels. At that time I was chemist of a large car-wheel foundry, and we were endeavoring to discover why one iron would give a good, hard chill, and another iron, although chilling, yet the chill would be soft and good for nothing; and furthermore, why one wheel would make a mileage of 10,000 miles, and yet another 100,000 miles. During my experiments I found that two elements played the most important part in the chilling of irons, and in the wearing property of chilled wheels; and these two elements were silicon and carbon. Consequently, I watched the action of these two elements more than any of the others. It was my good fortune to obtain a number of old car wheels which had records of different mileage. I obtained one which had made only 10,000 miles, and others which had made their 40,000, 50,000, 60,000, 70,000, and two that had made over 100,000 miles. The wheel that gave the least service and the wheel that gave the largest amount of service were found to contain almost identically the same amounts of both silicon and carbon.

It was in the chills of these two wheels that I discovered what I am convinced is a combination of silicon with carbon, and this combination of silicon and carbon was greater in the wheel that had made the longest mileage. This fact I also found whenever I tested a wheel that had made good service; this peculiar combination was always present in large quantities. As to how to obtain this silicon, the best way I found was to crush the chilled iron as fine as possible, dissolve in hydrochloric acid of 1.06 specific gravity, and during solution pass a stream of carbonic acid gas through the flask to prevent oxidation. After boiling for about an hour, the iron having been dissolved, there will be seen in the flask all through the solution small particles which would be taken for flocculent silicon, but of a slightly yellowish color. On filtering this solution and washing this apparent flocculent silicon with dilute hydrochloric acid to get rid of the iron, and then pouring on the filter a hot potash solution of the strength of 1.25 specific gravity, there will now be observed to be a strong effervescence and hydrogen will be given off in large quantities. This apparent silicon will be dissolved and pass through the filter in solution with the potash; in the filter will remain a black mass which resembles black varnish more than any thing else I can compare it to. Now these facts were not once obtained, but repeatedly, and I always found that those wheels that had made the largest mileage invariably contained a large amount of this form of silicon, while those wheels that had made a small mileage contained very small quantities of this same silicon.

Further, wishing to use some cheaper irons than the cold-blast charcoal irons, and at the same time irons that would give as good wearing chills as the old cold-blast irons, I, through the kindness of Captain Jones, of the Edgar Thomson Steel Works, was allowed to take tests of the heats in the Bessemer converter at different stages of the blow.

My first test was made of the cupola iron as it ran into the converter. I then blew the heat about three and a half minutes, turned down, and took a small test. This test, on being broken open, was found to be fair gray iron. These two irons, the test of the cupola iron and the iron that had been blown three and a half minutes, were the next day melted in crucibles, and we made what is known as "chill tests" of them—that is, a small mold is made with three sides of sand and the fourth side of iron. The test pieces were about six inches long, and about two inches by one-half inch. On breaking these tests, the cupola metal was not chilled at all, while the partially Bessemerized metal was found to be chilled for over an inch in depth. On testing this chill for this peculiar form of silicon, I found that it contained it in large quantities. We, therefore, determined to make car wheels of this partially Bessemerized metal, and see how they would wear. We made the wheels, and put them into service. The last that I heard of them was about two years ago, when they had made their 250,000 miles, and the report was that they were not worn out yet.

Now, I think from this report of the good service of these wheels that it certainly shows that this insoluble form of silicon plays a very important part in the wearing properties of chilled car wheels. Another very curious fact, which seems to show that the carbon exists in these chilling irons in some different form than in the hot-blast or non-chilling irons, can be proved by dissolving some of the boring of a chilling iron in strong hydrochloric acid, evaporating to dryness and heating until the chloride of iron is all decomposed, then redissolving in hydrochloric acid, filtering and washing residue free from iron. Now, if we pour on the filter a hot solution of potash of the same strength as before mentioned, viz., 1.25 specific gravity, we will obtain a filtrate which will be colored according to the depth of the chill which the iron will take if it be melted and poured against a chilling surface. The deeper the color the greater the chill. By this test I was able to predict how deep a chill an iron would give before it was used. I think this certainly proves that silicon and carbon do exist in forms which exert great influence on certain properties of cast iron, and, if they do in pig iron, why should they not in steel?

## Suspension Car Trucks.

Mr. Bushnell, master mechanic of the Burlington, Cedar Rapids & Northern Railway, is changing the suspension trucks he has had in use to the standard pattern. The suspension truck has been hard to keep in running order, while in service it has not been deemed easier riding than the common truck. The suspension truck came into use with a tremendous flourish of trumpets, but the hardest kind of blowing has failed to give it a long life. Its failure illustrates how seriously our brightest mechanical men may be deceived by a well-advertised novelty.

At the Master Car-Builders' Convention held at Chicago, in 1883, an attempt was made to get the association to indorse the suspension truck as its standard, and there was rather a strong tendency to do something in that direction till Mr. John W. Cloud said:

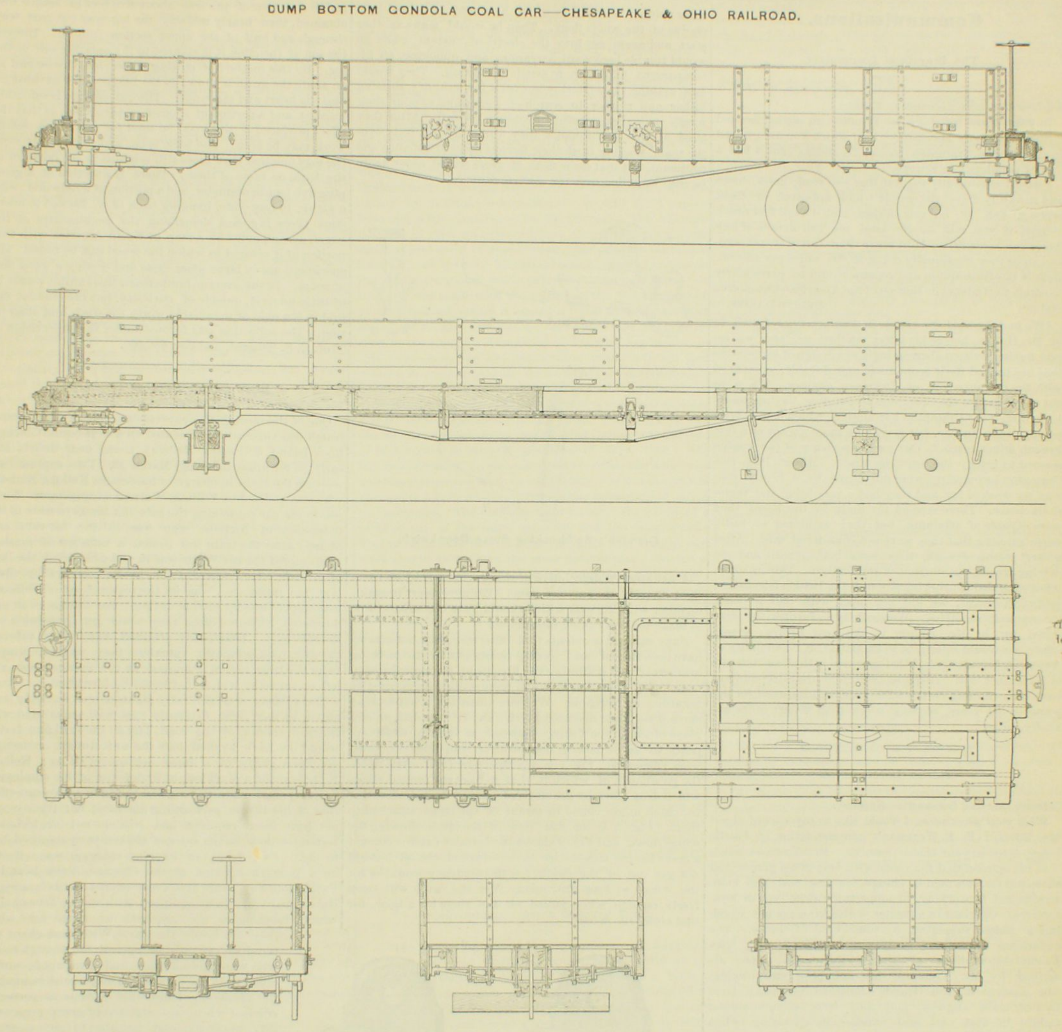
"I have listened to the discussion on trucks with a great deal of interest and it does seem to me we are devoting a great deal of discussion to a new matter which is not worthy of our consideration so extensively. The gentleman who first spoke of the suspension truck here states that its general introduction is a matter of two or three years. But I presume that not one-hundredth of one per cent. of the money which will be spent for trucks in the next year will be spent for suspension trucks. Large sums of money will be spent for trucks that we know something about, and something about the life they will stand. No suspension truck has been running long enough yet for master car-builders to have an idea of what the truck is going to cost the roads which they represent, and, therefore, it seems to me that we will have to be a little more conservative in this matter than the discussion this morning indicates we have been, or else we may find in the course of two or three years, that we have been too rash. Those things very often turn out that way, and I, therefore, think the legitimate direction for this discussion is more in the line of stating what things in trucks, whose general form we know and have used, are desirable in a new standard truck. The truck manufacturers of the country, if I may say so, have so much inertia, that it is absurd to suppose that the drift of this question is to be diverted between now and this time next year to a channel entirely different. All the precedents are against it. I do not mean to say that the suspension truck is not a good truck. I do not mean to say that it will not eventually prevail. I do not know that. But I say now, that we are much more concerned as to how we will spend a greater sum of money than we shall probably spend for suspension trucks, and if we should continue the discussion on lines that will show us how to expend money for trucks that we shall buy before we meet again, it will be more profitable."

This conservative speech probably prevented a serious mistake.

## The Huber Freight Brake.

Mr. Huber, whose communication relative to the proposed freight brake tests appeared in our last issue, thinks he was misunderstood in the comment we made upon it. He now writes that he does not wish to have his brake recognized in the proposed tests, and that his suggestion that the Car-Builder's Association should designate a time and place for the examination of models of recently invented brakes, was not that any decisive action should be taken looking to the adoption of any of them from an inspection of the models, but merely that they might be examined.

DUMP BOTTOM GONDOLA COAL CAR—CHESAPEAKE & OHIO RAILROAD.



DIMENSIONS, ETC.

| | |
|---|---|
| Length over end sills | 35′ 4″ |
| Length of body in the clear | 33′ 0″ |
| Width over side sills | 8′ 2″ |
| Center to center of axles | 4′ 10″ |
| Height of box | 3′ 0″ |
| Diameter of wheels | 33″ |
| Weight of car | 24,000 lbs. |
| Capacity of car | 40,000 " |

This car was built by the company to accommodate a growing coal traffic on its lines and connections west of the mines, which are mostly in West Virginia. For its sea-board and eastern local coal trade, hopper bottom cars are used almost exclusively, the cost of handling having been reduced to a minimum by the erection of trestles, chutes, etc. But in practice, this type of car has proved nearly useless for other kinds of freight, while on the lines west of the mines no chutes and trestles have been constructed.

As a compromise, the drop-bottom gondola, as shown in the cuts, was brought out. It is designed so as to have a large dumping capacity, and at the same time, when used for other freight, a virtually unbroken floor space. The peculiarities in its construction are the continuous center sill, the double winding gear and doors, the hinged end doors, and a capacity of 40,000 pounds. The continuous center stringer is an element of strength that will prolong the life of the car, and at the same time afford a ready means for fastening the draft timbers.

A car of this class was exhibited at the car-builders' convention at Old Point Comfort last summer, and attracted attention from the fact that the winding-shaft and chains were so arranged as to be below the level of the floor and at the same time not in contact with the coal, a point that will be appreciated by those who have to handle coal that has been exposed to wet long enough to pack around the winding gear, and also by those having lumber, logs, etc., to load.

The car, as a whole, seems well designed for the service intended, and in the matter of strength is fully up to the requirements of modern heavy trains. The trucks are the company's standard channel bar swing motion. Those shown at Old Point Comfort were equipped with the Scott graduated bolster springs.

## A Caustic Soda Locomotive.

A company has been formed in Chicago to introduce the Honigmann fireless motor for the operating of street railways, and for other purposes where steam motors are objectionable, and where the work is a weariness to horse flesh. A motor weighing about four tons was imported from Germany, and it has been tried on the Chicago City Passenger Railway Company's tracks; but it was found deficient in tractive power, and could not climb the steep approaches to the river bridges. It has now been taken to Minneapolis, and will be tried on some of the street railways in that neighborhood.

The motor appears to possess the elements that ought to make it successful as a substitute for horses. It is noiseless in its operation, and is entirely free from steam, smoke or dirt. Power for operating the machine during a round trip is obtained by the great capacity which caustic soda possesses for absorbing heat.

The inventor, Mr. Moritz Honigmann, is a caustic soda maker in Germany. In seeking for an economical method of reducing the dilute soda to a solid form, he introduced a closed steam coil into the soda boiler. The coil having sprung a leak, Mr. Honigmann observed that no steam was given off from the surface of the soda solution, which led him to the discovery that the latter was capable of absorbing large quantities of steam and its contained heat without giving off vapor. This suggested the idea that a body of heated caustic soda might be used, in connection with a steam boiler, to furnish the heat required for steam making during a short trip. The Honigmann caustic soda motor is the embodiment of this idea.

The motor has an upright boiler which is surrounded by an annular reservoir, which is filled with caustic soda highly heated. At the start, the heat of the soda mixture just keeps the steam in the boiler at the working pressure. When a start is made, the steam passing through the cylinders is exhausted into the soda tank, where it is condensed and imparts its heat to the contents of the tank. This tending to raise the temperature of the soda, and the temperature of the boiler tending to decrease in proportion to the quantity of steam that has passed out, the magnified heat in the soda tank passes into the steam boiler, thus maintaining an equilibrium. After the motor settles down to regular work, the heat passes so quickly from the soda to the boiler that the steam is maintained at an even pressure. For a short time there is more heat developed in soda reservoir and boiler than there was at the start, the increase no doubt resulting from the chemical reaction of mixing the soda with water, or its equivalent, steam. After a time the soda gets so diluted that its capacity for storing heat deteriorates, and the charge has to be removed and a fresh supply put into the reservoir. The deteriorated soda is restored in strength by evaporation of the moisture.

## Communications.

### The Crampton Locomotive.

LONDON (ENG.), Feb. 20, 1886.

*Editors Car and Locomotive Builder:*

In your issue for January I notice an article headed "Noah Webster's Locomotive," in which you are pleased to criticise the Crampton engine, by stating that it had a "brief popularity in Europe."

I would respectfully suggest that you read, mark, learn and inwardly digest the article which appeared in *Engineering*, Feb. 19, on this subject, and I shall feel much obliged if you will kindly send me full details of any American locomotives built more than thirty years ago, and since then continually doing 25,000 miles per annum. Details of consumption and repairs would be particularly valuable to students in Europe of the American locomotive system. DRUITT HALPIN.

[We had digested the article in *Engineering* referred to by Mr. Halpin, before his letter reached us, and we regret having written disparagingly of a design of locomotive that has proved itself economical and durable, compared with the ordinary run of European engines. We were not very hard on the Crampton locomotive, having merely written "the Crampton locomotive, which had a brief popularity in Europe, but is seen no more except on a few French minor roads." Our own experience of the engine seemed to justify the remarks made. About 1856, two Crampton locomotives were purchased by a Scotch railway we worked for, and they had a very brief and inglorious career. There seemed no limit to the speed they were capable of attaining, but they oscillated so badly when running that they were not considered safe. After a short season of work, they were both rebuilt and the driving wheels put in front of the fire-box. During somewhat extended journeying through the British Isles fifteen years afterward, we did not meet with half a dozen Crampton locomotives. We shall try to furnish the data asked for by Mr. Halpin in the near future; meanwhile, we would refer him to an article on "Durability of American Locomotives," that appeared in the CAR-BUILDER of November last. There he will find that locomotives have been running on the Illinois Central Railroad for upwards of 30 years, making more than 30,000 miles annually.—EDS.]

### Fairlie Locomotives.

*Editors Car and Locomotive Builder:*

With your permission, I would like to say a word about Mr. Edward E. R. Tratman's commendation of Fairlie locomotives in your March number. Mr. Tratman gives it as his opinion that for roads with very steep grades and sharp curves, it would be cheaper in first cost, and more economical in working, to adopt the Fairlie type of locomotives. Opinions in a matter of this kind are not worth much unless supported by some kind of proof. The experience of railroad companies in this country with Fairlie locomotives of the double-ended type, described by Mr. Tratman, has not been encouraging. The Denver & Rio Grande Railroad Company tried two of these engines, and they were a monumental failure in first cost and expense in operating when compared with Baldwin locomotives. I have not got the exact figures at hand, but know my memory is not far out in saying that the cost of repairs and of operating was nearly double the expense incurred by the Baldwin locomotives to do the same amount of work. From a report made several years ago of the comparative cost of American and Fairlie locomotives in operating the Mexican Railway, the Fairlie engines were shown to cost 79.32 cents per mile, while the American engines cost 37.66 cents per mile. It is a good plan to look up figures of this kind before indulging in the worship of strange gods. Before our longing for novelty induces us to look abroad for strange types, we had better look into the value of our own products. A. F. THOMAS

### Geese Crossing an Electric Railway.

When the electric street railway was first opened in Baltimore, the conducting rail was left exposed, the engineers thinking there would be no danger to life from the low tension electrical current employed. There appeared to be no danger to human life, and little inconvenience to persons who accidentally got within the circuit, but most of the lower animals are much more susceptible to electric shocks than human beings, and there were many amusing sights seen among animals that got accidental shocks. Horses and pigs were very sensitive to the electricity, and manifested stirring emotions under its influence. But the most entertaining sight was when a flock of geese came waddling along and got on to the rail. The leader would proceed unconcernedly until he raised one foot upon the rail, then he would spring back with a wild quack and look round with an indignant stare to see who had committed the outrage upon his dignity. Seeing nothing that he could reasonably blame, he would utter some voluble remarks in which he would be joined by a chorus of the whole flock. Then he would make another start and again get into the electrical current, when he would tumble backward, screaming and quacking, all his companions joining in to swell the tumult. They would keep making the wildest noises for a few minutes, running hither and thither in search of something to pour their wrath upon, but carefully avoiding the rail. After they tired of this performance they would fly in a body over the track, sending forth their fiercest notes of defiance and contempt, but that same flock of geese would never again be seen waddling over the electric railway.

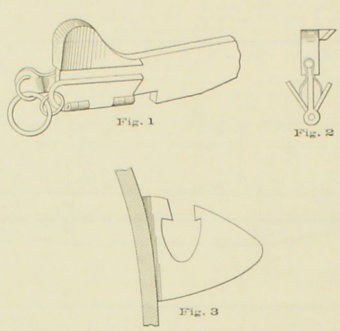


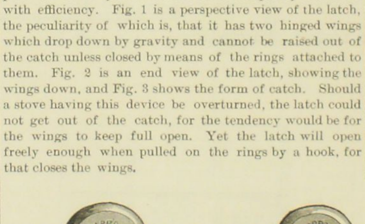
Fig. 1 Fig. 2

Fig. 3

Crandell's Self-Locking Stove Door Latch.

A PARAGRAPH descriptive of this device was by an oversight inserted in our last issue. We now insert it again, together with the cuts which should have accompanied it to make the description intelligible.

Many railroad accidents that otherwise were not serious have been turned into terrible holocausts by stoves being overturned and scattering the fire about through the open door. Any invention that will reduce this danger must be regarded as valuable. We here illustrate a self-locking stove door latch, invented by Mr. G. T. Crandell, an employé of the Union Pacific Railroad, at Omaha, which appears to us to possess the merits of simplicity combined with efficiency. Fig. 1 is a perspective view of the latch, the peculiarity of which is, that it has two hinged wings which drop down by gravity and cannot be raised out of the catch unless closed by means of the rings attached to them. Fig. 2 is an end view of the latch, showing the wings down, and Fig. 3 shows the form of catch. Should a stove having this device be overturned, the latch could not get out of the catch, for the tendency would be for the wings to keep full open. Yet the latch will open freely enough when pulled on the rings by a hook, for that closes the wings.




"The Dayton" Freight Car Door Fastener.

THE cuts represent a new device for the fastening of freight car doors. The points of superiority are as follows:

1. It has no loose parts or chains, to be broken or lost. 2. It is very strong and perfectly simple; any one can see at a glance how it works. 3. It can be put on the door, or the door-post, working either right or left. 4. It can be sealed with wire or tin seal, or locked with padlock. 5. It is the cheapest and best fastener in the market. 6. It has double-slotted hasp, so that, if desired, the door can be locked open for ventilation. Single-slotted hasps furnished if preferred. Any style of hasp made to order. Manufactured by the Dayton Malleable Iron Co., Dayton Ohio.

### Specimen Woods of North America.

The American Museum of Natural History, in New York, contains the most complete exhibit of native woods ever collected in this country. It is called the Jessup collection, and consists of 301 varieties and species. There are 337 pieces, there being several duplicates. In their preparation a section of the tree about five feet in length was obtained, then nearly midway the log was cut part way through and half of the upper section split off. Toward the top of the stick it is slanted to the opposite side of the log. By this method of cutting across, lengthwise and at an angle the grain is shown to the best possible advantage; also the heart and sap wood. The cut surface is smoothly finished, and a portion of it oiled, or varnished, so that the effect produced if the wood be used for cabinet or inside work may be seen. The bark is on, and so carefully were the logs handled that moss still remains in the crevices of the bark on some of them. There is a section of a great pine five feet in diameter, and a portion of a redwood, with a plank, 10 feet wide, hanging back of it. Tacked to every stick there is a card describing the peculiarities of the wood, accompanied by a map of North America with that portion of it colored in which the wood can be found. The specimens are in large glass cases and occupy a good deal of room. To the average lumberman this exhibit would be of little interest, outside of curiosity, but the student can find in it a field of invaluable worth for study and observation. The collection was formed under the supervision of Prof. C. S. Sargent, and cost $50,000.

### Rock Island Express Robbery.

One of the most daring express car robberies ever perpetrated was successfully executed on a west-bound Chicago, Rock Island & Pacific Railway train, near Joliet, Ill., early on Saturday morning, March 13. Two express cars were on the train in charge of messenger Kellogg Nichols, who was assisted by William Watts, a baggageman. Watts was in the car containing the safe, but the keys were in the possession of Nichols, who was in the forward car. Shortly after the train left Joliet, a number of masked men entered the car Watts was in and demanded the key of the safe. He referred them to Nichols, telling them that the messenger was in the forward car. While one man kept Watts covered by a gun, the others went and murdered Nichols before they could get possession of the safe key. That being attained, they went through the safe, took whatever valuables they wanted, jumped from the train before it stopped at the next station and left no traces by which they could be identified.

The robbery was skillfully planned and daringly executed by men who evidently were well acquainted with the train service of the road, but all the skill and daring would not have availed had the unfortunate messenger not been guilty of a fatal neglect of duty. Kellogg Nichols made a plucky fight in defense of his employer's property, and made the highest sacrifice a man can offer, that of his life in performing his duty; but these would not have been required had Nichols not neglected to fasten the door, as the rules of his company required him to do. Ever since an express robbery was effected on a Western division of the Chicago, Rock Island & Pacific Railway, years ago, every express car belonging to the company has been equipped with strong door chains, which messengers are required to keep on when they are inside the car. With that chain up, the door can only be opened far enough to see who wants admittance, and it cannot be unfastened from the outside. This precaution against the admission of improper persons is perfectly efficient when used, and a very grave responsibility, to say the least, attaches to any employé who habitually leaves this safeguard down. This, it appears, Nichols was in the habit of doing, and the robbers were no doubt aware of the fact. This express messenger who paid so dearly for his temerity was by no means exceptional in his habitual defiance of danger. The practice of leaving doors of express cars unfastened while trains were on the road, was very common. In this as in many other departments of train service, familiarity with danger breeds contempt, and the men are only aroused from their apathy when a fatal blow is struck at one of their number. At present there is a revival of vigilance among express messengers, door fastenings are closely attended to and revolvers are kept convenient for service. But this is not the season of danger. The time of danger will come round when the messengers begin to forget the lesson of Nichols' death. When the time comes that doors begin to be left unfastened on the road, it will pay express companies to put on inspectors to check the practice.

ONE of the passenger locomotives belonging to the Boston & Albany road has been equipped with a radial valve gear invented by Mr. H. G. Manning, chief draftsman with Mr. Colby, the master mechanic at Boston. The advantages claimed for the valve gear over the link motion are, a more rapid port opening for steam admission, and a wider opening when cutting off short, a constant lead and a constant exhaust.

MR. WILLIAM H. FENNER, well known from his connection with the Rhode Island Locomotive Works, has accepted the position of president of the Allen Paper Car Wheel Co., and will have his office in New York.

### Some Revolutionizing Inventions that Didn't Revolutionize.

Sundry suggestions have been made of late as to the expediency of establishing museums of early railroad devices for the benefit of posterity. A national collection of this class of mechanical curiosities, showing the rude beginnings of the present marvelous development of railroads, would be highly instructive as well as diverting. Without going back to primitive things, such as the "Tom Thumb" engine and other antiquities of that period, a very interesting catalogue of mechanical curiosities might be compiled from the records of technical journals in this country within the past eight years. Some of these were of the "revolutionizing" kind—ambitious projects that successively burst upon the world like meteors, and after attracting much attention for a time, as suddenly disappeared and were thought of no more, or were remembered only as conspicuous failures. These fiascos should have a place in the proposed museums, either in the form of drawings or models or a descriptive record. Could all of them be recalled from oblivion, their number would be quite surprising, and a study of them would inspire a wholesome distrust of the many new schemes that are constantly being devised for superseding what has already stood the test of utility and practical service. We will advert only to a few sample specimens relating more or less directly to the economies of railroad operation.

The first in the order of dates (1878) was a new fuel, the invention of Mr. S. C. Salisbury, of New York. It was said to be a residuum of petroleum and coal tar, mixed to the consistency of molasses and atomized by contact with a current of super-heated steam, when it was discharged in the form of a fierce and delicate spray into the blazing furnace, and generating a heat that melted pig iron in ten minutes; and what was most wonderful, this intense heat, estimated at 8,000°, was generated in total darkness. Highly satisfactory experiments, according to report, were made with it the same year at the Brooklyn Navy Yard, the result being followed by the announcement that the city of Pittsburgh, on account of its nearness to the oil regions, was to run 300 blast furnaces with the new fuel and become the greatest manufacturing city on the globe, and that ocean steamers were to be entirely relieved of coal freight and save thereby $5,000 a trip.

The following year (1879) witnessed the advent of the Prosser Twin-Cylinder Car, which was to revolutionize the transportation of grain by carrying it in two enormous cylinders made of boiler iron, each cylinder holding as much as an ordinary box car, and revolving on an axle running through the centre, upon the ends of which were the journal boxes. Tires, flanged and fitted to the gauge of track, were put round the cylinders and were the wheels of the car. The car was run on the C. B. & Q. road, making six round trips of 200 miles, carrying the grain magnificently, and turning it out at the end of the trips a grade better than when it was received. Conductors and yardmasters were delighted with it. There was said to be no trouble in passing curves, frogs and switches, the draft was easy, there was less friction and dead weight, a lower centre of gravity, less lubrication and wear of track; and, furthermore, the car was fire-proof, and, according to report, one locomotive could haul as many of the cars as could be put behind it. And yet the thing was not a success, and didn't revolutionize grain transportation to any appreciable extent.

The well known Miltimore compound car axle with an independent wheel motion, after many improvements had been made in its construction, was perfected in 1879. It was a very complete piece of mechanism, and the numerous tests to which it was subjected were attended with highly satisfactory results as compared with rigid wheels and axles. So far as could be demonstrated by performance, it was a safe device, with little or no danger of breakage or heated journals; there was no leakage of oil, an extremely small quantity of lubricant was required, the wheels made double the mileage of rigid wheels, there was scarcely any flange wear, the cars ran easier and steadier, wheels could be used on the same axle without being accurately mated and without any increase of wear or draft power, and a wheel could be taken off and replaced in an hour without going to the shop. Yet no running tests, however favorable, could eradicate from the minds of railroad men the distrust of complication and piece-work inseparable from all independent wheel movements, and this labored and costly attempt to do away with rigid wheels proved a failure. It could not even get a permanent foothold on the elevated lines of New York City, where such a device was especially needed on account of the exceedingly sharp curves.

The next phenomenon was the famous Fontaine locomotive, which appeared in 1881, and for a time seemed to be a notable advance in locomotive construction, so far as the testimony in regard to its performance was entitled to any weight. It had upper and lower driving-wheels, the power being applied to the upper ones, and the cylinders placed at an angle for the purpose. It ran on the Canada Southern road several months, hauling seven passenger cars at the rate of a mile a minute, and ordinary freight trains as economically and satisfactorily as with larger engines of the usual type. Yet it was constructed upon an irrational theory, and in violation of one of the fundamental principles of mechanics. It was claimed by its projectors, however, that the engine was a success so far as fast running with comparatively light trains is concerned, and that its ultimate failure was due to breakages caused by bad construction and poor material, and a prejudice on account of its excessive height and the difficulty of handling it with the ordinary shop appliances.

In the same year the wonderful "hydro-carbon" locomotive was heralded to the world by columns of newspaper puffery and extravagant assurances that it was to revolutionize the motive power of the world. It was built for the projectors by the Grant Locomotive Works, and was to generate and burn hydrogen gas from water by the Holland process, saving 90 per cent. of the cost of coal consumed by ordinary locomotives. It had 2,174 copper flues and a fire-chamber with 352 burners. The combustion was of such an extraordinary nature that the greater the heat and ratio of evaporation, the smaller the minimum of cost in fuel. Months of preliminary experimenting and testing had made success a dead sure thing. A trial trip was made with the engine on the Newark branch of the Erie road, where it hauled a "full-fledged passenger train" 19¾ miles. The last we heard of it was its performance at the Chicago Exposition of Railway Appliances, in 1883, contaminating the atmosphere with its fumes, and making it quite impossible for any body to ride behind it, no matter how much the economy in fuel might be.

Another revolutionizing invention of a more recent date, was a "cylindrical steel passenger car," which was in the course of construction by the Robbins Cylindrical Car Co., of Boston, and about half completed in July, 1884. The builders published an elaborate picture of it, and a descriptive circular setting forth its superiority over wooden cars in numerous details relative to the prime requisites of safety and economy. The cost was to be no more than that of a wooden car of the same capacity, and the weight from four to eight tons less. Postal, baggage and freight cars were also to be built on the same general plan. So far as we know, this car may have been completed, and possibly may now be running on some of the New England roads, and realizing the most sanguine expectations of its designers and builders. If so, the matter has for some reason been kept remarkably quiet.

Another of this class of inventions, and the last that we shall now refer to, was, or is, a three-truck freight car, or a car with a central supporting truck to increase the carrying capacity without increasing the weight of the body structure. If we mistake not, a number of cars of this description have been built and put in service with very satisfactory results. They were in use some years ago on the Iron Mountain & Southern, and more recently, we think, on some of the Northwestern roads. If the reinforcing center truck really serves the purpose for which it was intended, and there are no drawbacks in running to offset the theoretical advantages, such cars ought to be more extensively used in these days, when it is so desirable to carry increased loads without adding to the weight upon each journal or increasing the size of axles.

### Telegraphing from a Moving Train.

A very successful test of Edison's system of telegraphing from a moving train was conducted recently on the Chicago, Milwaukee & St. Paul Railroad. On a table in the baggage car was a peculiar instrument designed by Edison specially for this work. The operator had two hoods that covered his ears, and were connected by wires with the instrument, the object of the hoods being to exclude the sound of the moving train. A wire connected the instrument to the trucks of the car, and thence by the rails to make the ground connection.

The tin roofs of the cars composing the train were charged with electricity by means of a simple electro magnet, and were connected with each other by wires. The complete electric current was obtained by induction, the electricity jumping, as it were, from the tin roofs to the telegraph wires along the track. A great many messages were sent and received when the train was in motion, and the test was declared as satisfactory as could be desired.

This, and other tests made on Eastern roads a month earlier, demonstrate that keeping up telegraph communication with a moving train by the Edison system of induction is a practical success. But now comes the more practical question, Of what use is the system likely to be in ordinary train operating? In ordinary practice, the movement of trains is regulated by a dispatcher located at a terminal station, and the whereabouts of all trains is kept before him by means of station reports. The system is as simple and satisfactory as a naturally complex system can be, and it is extremely rare that mistakes are made. It is alleged, however, that a dispatcher or operator occasionally makes a mistake, and trains get away from stations when they should be held, and disastrous collisions ensue. Cases of this kind are so very rare that we do not believe railroad companies could afford to introduce an immensely expensive supplementary precautionary system for the purpose of preventing an accident from a mistake that does not occur once in the moving of a hundred thousand trains. A precautionary system of this kind is exactly on a level with the inventions that propose to place a huge bell-mouthed chamber in front of each locomotive to scoop up stray bovines and land them safely beyond reach of the wheels, or of the immense telescopic arrangement of springs is to be pushed in front of the locomotive to break shocks of collisions. The Edison method of telegraphi from moving trains is a most ingeniously developed inve tion; but it is by no means the first meritorious inventio that railroads have no use for.

### Electric Propulsion on Elevated Railroads.

We have not hesitated from time to time to speak out plainly regarding the pretensions of would-be electrical engineers who claimed they could operate the elevated railroads of New York with electric motors, transmitting a fraction of the power expended by the steam locomotives in moving the trains. We have insisted that the first procedure toward trying to operate roads of this kind by electricity was to find out exactly the power required to operate them by steam. Persons calling themselves engineers went on record with calculations that made out the power expended in moving the trains to be about one fourth of what it really was.

In June last, we made a series of careful experiments with a locomotive on the Third avenue line in New York, to ascertain the power expended in moving the trains, and the results were published in our July number. Since that time, several electricians and other engineers anxious to arrive at the truth have been investigating the same subject in different ways, and it is gratifying to note that they come remarkably close to our figures. Mr. Frank J. Sprague recently read a paper, which was published in the *Electrical Engineer*, in which he gave particulars of investigations he had made to ascertain the power required to move trains on the elevated railroads. Of his labors in this direction, Mr. Sprague says:

"As a somewhat remarkable corroboration of theoretical by practical work, I should refer to the account of Mr. Angus Sinclair's work in the National Car-Builder of July. Through the courtesy of Col. Hain, manager of the Manhattan road, Mr. Sinclair, assisted by Mr. J. D. Campbell, general foreman of the Elevated Railroad machine shops, made a thorough test of the capacity and performance of one of the standard engines on regular duty. The engine was indicated for two round trips, that is, over a run of 34 miles, and all other necessary data taken.

"The average power expended during the whole distance [illegible] 77.8 h.-p., 10 per cent. of which is allowed for friction of [illegible] engine, leaving 70 h.-p. net. This by actual experiment.

"By theoretical determinations, I got 70.3 h.-p., which include 5 per cent. friction, or a net of 67 h.-p.

"The difference is 3 h.-p., or 4½ per cent., which may represent the excess of weight of train actually tested.

"Since these, similar results are obtained by totally different methods. Comment is unnecessary."

Mr. John D. Campbell made some independent tests with a dynamometer, and he came within 5 per cent. of our figures.

Mr. Sprague proposes to try operating the elevated railroads with an electric motor which he has invented. In describing his aims, he says:

By a system of electrical propulsion the power can be distributed underneath the cars—every car, or two cars if need be, being a unit—and at the same time arrangements can be made for propelling five or six cars under simultaneous control.

By distributing the power under the car, the whole weight of the car and passengers can be made effective for traction, such traction weight being six times as great as is afforded by the present locomotives. This will enable the cars to be started more promptly, brought to speed more quickly, and stopped in shorter intervals, increasing the mean rate of speed, and thereby the capacity of the road.

Weight is the necessary practical adjunct for traction. The elevated roads present a peculiar problem. To attempt to solve that problem by replacing the present locomotives by electric locomotives of lighter weight, or even of the same weight, is to shut our eyes to plain mechanical and engineering truths, and does not advance by one single step such solution.

The making of cars individual units of locomotion will enable the intervals between trains to be made one-third of the present schedule for a large part of the time. This would greatly increase the number of passengers during the day and night who would make use of the elevated roads, and this too, without materially increasing the running expenses.

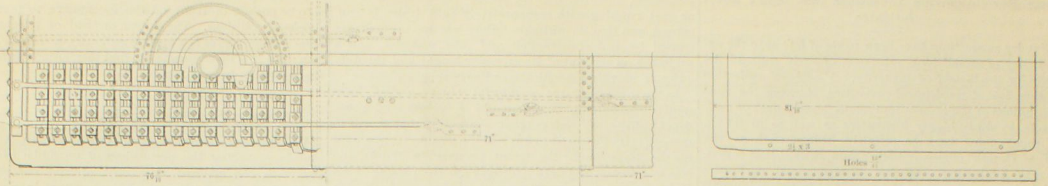
Another important advantage will be the great reduction in the vibration and wear and tear of the superstructure by distributing the weight so much more evenly. The weight upon the lattice girders between columns would always be less than two-thirds, sometimes only one-third that now existing, the vibration, tensile and shearing strains being in nearly the same proportion. The motion of the moving parts being rotary, the train would start more smoothly, and the motive power be less liable to derangement. Slipping or skidding, such as is now common both in starting and stopping, would be unknown.

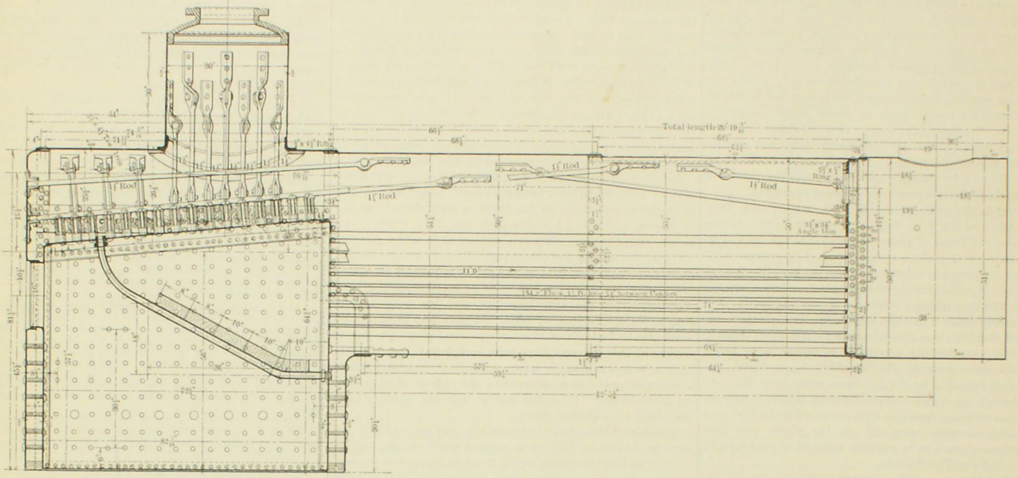
The objects thus far indicated as attained are important, and some of them would be very instrumental in the accomplishment of that most immediate and pressing object, the increasing of the carrying capacity of the road without reducing the time schedule.

This must be done, even if the operating expenses are increased. I am glad to say that it can be done with a decrease of these. It is a problem requiring some thought. There has been a great deal of Keelyism in connection with this subject. So much has been said about the ease with which the elevated trains could be operated by electricity, so many promises have been made, so many unreliable statements have found their ways into the press, that people have been led to believe that the change from the steam to an electrical system of locomotion would be quickly and readily made; and I must confess my own opinion that some of the projectors of electric railways have reckoned without their host, and have very much underestimated the character of the work which they have undertaken to perform.

When the problem of applying electricity to the operating of a railroad is entered upon in this wide-awake spirit, success will attend it if success is possible. We are by no means sanguine of seeing electricity applied to railroad operating in the near future, but we certainly admire the spirit in which this enterprise is undertaken and wish the promoters God-speed.

Gen. J. H. Devereux, President of the Cleveland, Columbus Cincinnati & Indianapolis Railway, died at Cleveland, Ohio, March 17, at the age of 54. He was prominently connected with railway service for nearly thirty years, during which time he filled many important and responsible positions.





LOCOMOTIVE BOILER—CHICAGO, ST. LOUIS & PITTSBURGH RAILROAD.

The boiler shown in the engravings is not a regular Pennsylvania Railroad standard, although used on one of the roads belonging to that system. It is a boiler designed by Mr. Wm. Swanston for engines that were not of the regular standard. The engravings show the details so minutely that little description is necessary. As will be seen, the boiler is of the straight type, with a single dome. All the plates are steel, and all the outside shell, including dome and smoke-box is, $\frac{3}{8}$ in. thick. The fire-box is also of steel. The crown sheet is $\frac{3}{8}$ in. thick, the side sheets $\frac{5}{16}$ in., and the flue sheets both back and front $\frac{1}{2}$ in. thick. The boiler is fitted with extension front of the Pennsylvania standard.

The cylinder part of the shell is made of two plates, with longitudinal seam in each, and these seams are placed above the water line. All longitudinal seams have welts on the inside, and all vertical seams are double riveted. All riveting, as far as practicable, is done with the button set and sledge.

It will be noticed that the crown sheet is both arched and sloped the height of the door sheet being $6\frac{1}{4}$ inches less than the height of the back flue sheet. One object of this is to give a free circulation of water. It also prevents mud from depositing on the crown sheet, and gives a closer contact of the flame with the sheets as it passes over the brick arch.

The engravings show the location of the air tubes inside the fire box, which were talked about at the Master Mechanics' Convention at Washington. Flues 2 in. diameter are used for this purpose, and they are set in the fire-box the same way as flues are set in the boiler. The tubes give no trouble, and are highly spoken of by Mr. Swanston for the efficient aid they give in preventing smoke and making the boilers steam freely.

## Contract Work in Railroad Shops.

Some time ago we visited a railroad repair shop where the work is paid for on the contract system. The men are paid according to the work they finish. When a man has done any work, he is required to fill up a slip giving particulars of the job done, and the time it took. This has to be indorsed by the gang boss and by the inspector of work and forms the data from which the man is paid. He is paid merely the rate value of the job done, without consideration of the time he worked at it, the time being merely given to indicate the relative expense of the work by day pay. Each operation on one piece of work is rated separately and paid for accordingly. Take a new side-rod, for instance, of a particular class of engine. There are the distinct operations, planed to size, filleted in milling machine, body of rod ground and polished, brasses planed, brasses fitted to strap. Different workmen have been employed on these operations, and each man sends in an account of the work he has finished, and gets paid for it. The same plan is followed with the facing of valves, boring cylinders, fitting shoes and wedges, or any part of the numerous details of mechanical labor represented in the rebuilding of a locomotive, repairing a tender, a passenger car, a freight car, or in making a crossing-frog or station signal. The work in all cases is reduced to a manufacturing basis, and paid for accordingly.

After a careful examination of the system, we were very much impressed with its advantage to the employer, but we believed it gave him a dangerous power of tyranny over the workmen. The general foreman of the shops, a most intelligent and clearheaded mechanic, who has no sympathy with injustice in any form, takes a different view of the case from ourselves, and has stated his opinions very freely in private letters. As his views on the contract system are very valuable, owing to the position he holds, and are given in a most lucid way, we take the liberty of publishing the following extracts:

"We are still working our men under the contract system, and I am more enthusiastic than ever in its favor. It is destined to become in the future the leading method of doing work. To an intelligent and skillful workman, it holds out great inducements; to an ignorant, unskillful and careless man, it gives nothing. On the contrary, it does not permit this class of men to impose upon their fellow-workmen, as is done under the day or hour systems. Tell me of a shop that you have ever known that has not had on its roll worthless men who were paid more than they were worth, and good men who were underpaid. That is not right, but how can it be changed under that system? I have worked with men who received as much money as I got, and I was satisfied they did not do half the work I turned out. The fun of the thing is, that if you were to ask one of these fellows about it, he would say that he was worth twice as much as I, and be honest in saying it. Ask the common foreman and he would tell you that there was not much difference between us, but that John Smith was worth more than both of us. Probably contract work would show that we were all wrong, and that the foreman was fooled the most among us. It has shown me many times that I was no judge of men's capabilities, and I am satisfied from my own experience that any shop foreman would find very great surprises were he to change his men from day to contract work.

"I fail to see the cogency of the objection you raise to the contract system on the score that it gives the employer too much power to tyrannize over the workmen. I do not see why an employer cannot tyrannize over men working by the day, just as much as when they are working by the piece, if he wants to. You can drive men as well one way as the other, although, as you observed, there may be more refinement in driving by contract work.

"I have now been in the midst of the contract system for three years, and I think that experience ought to enable me to estimate the value of the system fairly. My judgment then is:

"Contract work is the only just and right way of working both for employer and employé. You pay a man a given sum to do a given piece of work in contradistinction to paying a very uncertain sum for a still more uncertain piece of work. A works five hours on a job worth $1, and comes to the conclusion that it is spoiled unless he does considerable additional work on it. He puts in ten hours more and gets a job that will pass. You pay $3 for an inferior job and the operation is unjust all round. If A had been working on contract, in all probability he would have discovered that the job was spoiled before he put four hours labor upon it, and he would have seen that he could not afford to put more time out on it and the job would have been scraped at once. By the day system of pay in a case of this kind, you put a premium on poor work. This may seem far-fetched argument, but it is not It is telling the practice of daily work.

"The contract system makes better workmen than the other. It makes them expeditious, and the knowledge that nothing else will pass is an incentive to good work. Contract work develops a man's intelligence, and if there is no intelligence to develop, it sends the man to other work where he belongs. The men who make the most money are not the hardest workers, but the men who manage their work the best. It requires brains as well as brawn to make a success in piece work. The system makes men more independent, for they can work hard or take it easy as suits them, and there is no constant watching of bosses.

"The men whom I used to think were the best machinists have been found by the contract system to be wanting in many respects. The rushers are badly left, and the fellows who were good, but slow, have come to the front, and they are the men who quietly roll up a bigger check than any man in the shop. I have no use for the lightning machinist any more.

"If you ask our men to-day, 'Do you like the contract system?' they will answer 'No.' But ask them if they would like to return to the day system and the old rates, and they will say the rates were too low. On the whole, a man who is willing to do a fair day's work thrives under the contract system, but it is death on loafers. Its saving to the company is beyond question."

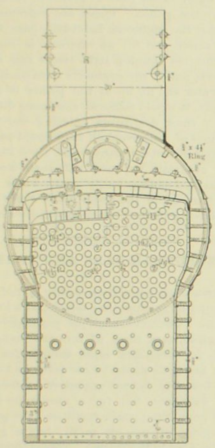
## About Car-Hogs.

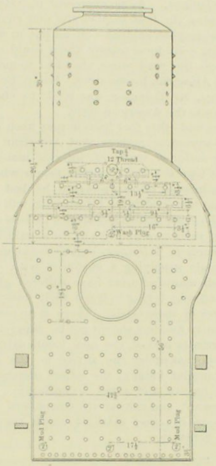
The railroad car-hog is one of the disagreeable things developed by railroad progress. Although technically a biped, he seems to be more nearly allied to the genus quadruped. He has become a target for sharp squibs and unqualified censure, but no amount of ridicule or denunciation has any effect in the way of softening his hard and selfish nature. He is apparently irreclaimable. No legal process can reach him. He can not be boycotted nor lynched, and his callous sensibilities are proof against all written or unwritten codes of civility.

There are a good many distinct varieties of the car-hog, although the term, as commonly used, is understood to mean a person who looks upon the car he happens to be riding in as his own individual property, and upon every body else in it as intruders; and he therefore has no scruple about appropriating to himself as much seating

room as he can spread himself over, and from which he can only be dislodged by strategy or assault. The other varieties of the hog are, as a rule, somewhat less aggravating, for the reason that their rudeness does not arise so much from ingrained selfishness as from lack of training in regard to the decencies and proprieties of life. They have less of the surly, unaccommodating spirit which distinguishes the car-hog proper, but the annoyance they cause is sometimes very exasperating.

There is the car whistler, who whistles unconsciously from force of habit. He pitches his music in a low key and fancies he is whistling to himself while he is tormenting every body within hearing. Then there is the baked peanut eater, the loud talker who has a liking for argumentative controversy, or who thinks that every body around him is interested in the details of his business or





his views of current political issues. But the most maddening of all tormentors is the man who reads aloud newspaper accounts of prize fights and murders, or whatever else his seat companion will listen to. These wretches are almost invariably bad readers, and make havoc with the pronunciation; casualty is "caus*al*ity," municipal is "munic*ip*ial," preventive is "preven*tat*ive," and so on, all of which is perfectly ravishing to the ears of the college professor or clergyman in the adjoining seat. Then there is the window question, which is so familiar to all travelers, both the sinned against and sinning, that the mere mention of it is sufficient. Locking the seat-backs so they can not be reversed at pleasure is an excellent practice, and prevents many a well-dressed hog from reposing his hoofs on the cushion of the next seat. There is a habit very common with young men, as well as with men that are not so young, of bracing their knees against the back of the seat in front of them in order to get themselves into a reclining posture. This is grossly annoying to the occupants of such seat, especially if they are ladies. Offenders of this class should know that each seat and seat-back is the exclusive property for the time being of its occupants, and that any encroachment upon it is unpardonable rudeness. The catalogue of offenses of this class might be very much extended, but those to which we have alluded will indicate the character of the rest.

Railroad companies and car-builders have exhausted the resources of money and skill to make people who ride in their cars comfortable and happy, collectively. But mere mechanical devices in the way of luxurious seats, elastic springs, foot-rests, salubrious air, a well-regulated temperature and costly decorative surroundings, can not insure civility and mutual courtesy among the passengers themselves. There is no mechanical device by which common sense can be pumped into the heads of boors and blatherskites as air can be pumped into a brake reservoir, or by which uncongenial natures can be harmonized. The passenger car is the home for the time being of fifty or more people who are brought together indiscriminately, and there is no place more favorable for the exhibition of good breeding, or the lack of it, on the part of the occupants. It is to be hoped that the car-hog of the period is not an abiding institution, and that he will finally succumb to public censure and mend his ways.

### Serving the Pullman Car Company.

People anxious to preserve the simplicity of habits befitting republican institutions sometimes have perceived danger to the whole body politic in the luxurious habits of Pullman car employés. It is generally understood that the lordly Pullman company has spared no money or energy in making its conductors and porters appear before the public as pampered representatives of effulgent luxury. To support the ostentation of his position the conductor is paid $70 a month, from which he pays out about $20 a month for meals on the road, and the remainder is still further reduced by a judicious system of fines, which does not leave too much to fall into bad habits with.

The porter is paid $16 a month, which supplies him with unlimited energy in pounding backsheesh out of the passengers. By refined skill, the Pullman Car Company takes more out of the ordinary porter for meals on the road than it pays him, but they have the satisfaction of knowing that it comes out of its natural enemies, the passengers.

Amidst all this, it is touching to witness the solicitude of the company for the welfare and personal safety of its employés, especially in seeing that accidents to their persons do not entail financial responsibility upon the company. Towards this end the company has recently required all its trainmen to sign the following contract:

"That I may be suspended, definitely or indefinitely, with or without pay, or be discharged from such employment and service at the pleasure of the Pullman Co., or at the pleasure of any General, Division or Assistant Superintendent, or authorized agent thereof, at any time without previous notice, such notice being thereby expressly waived."

"That in consideration of such employment and service and the payment to me of the wages or salary now or hereafter agreed upon, and as a part of the agreement for such employment and service and the payment of such wages or salary, I hereby undertake and bind myself to assume all risks of casualties by railroad travel or otherwise, incident to such employment and service, and accordingly hereby release, acquit and discharge the Pullman Co. from any and all claims for liability of every nature and character whatever, to me or my heirs, executors, administrators or legal representatives on account of personal injuries or otherwise."

The other clauses make it necessary for the employé to bind himself to obey the rules and regulations of the railway companies over which the Pullman cars are operated, and in consideration of free transportation, if injured, acquits and discharges the railway company from liability, etc.

This release is signed, sealed and delivered in presence of a named official, and forwarded to the Secretary of the Pullman Co. at Chicago, Ill.

### A Mexican Locomotive.

Mr. F. W. Johnstone, Superintendent of the Mexican Central Railway, has designed and built a curious form of locomotive for working the heavy grades of the road he is connected with. The engine has four cylinders and twelve driving wheels, six of the latter being under the tender. The engine and tender weigh 185,000 pounds when the tender is half loaded with water and coal. There is a four-wheel truck in the front of the engine, and another four-wheel truck between the engine and tender. Engine and tender together have ten pairs of wheels, the total wheel-base being 52 feet. The cylinders are 22x18 inches, and transmit the power to a lever or beam to which the main rod connects, giving the crank-pins a stroke of 36 inches. The cylinders that work the engine driving wheels are placed outside the smoke-box, similar to those in an ordinary American locomotive, and the cylinders that operate the tender driving wheels are placed under the cab. All the driving wheels are 57 inches diameter. The boiler is straight and is 63 inches diameter at the smallest ring. There are 304 tubes $2\frac{1}{4}$ inches diameter in the boiler. The fire-box is 72 inches long inside, 84 inches wide and 82 inches deep. The grate area is 42 square feet, and there is a total heating surface of 3,442 square feet. The tender holds 4,000 gallons of water and carries 6 tons of coal. The engine is equipped with the Westinghouse automatic air brake, which operates on all the drivers.

NATIONAL CAR AND LOCOMOTIVE BUILDER

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### EDITORIAL ANNOUNCEMENTS.

**Advertisements.**—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

**Contributions.**—*Articles relating to railway rolling stock, construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

**Special Notice.**—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.*

### AMERICAN AND ENGLISH LOCOMOTIVES.

Several months ago a writer in an English contemporary, in trying to explain away the annoying circumstance that several British colonial railways were purchasing American locomotives, took occasion to make some disparaging remarks about the character and value of American locomotives. As remarks of the same kind exude perennially from the same source, we proceeded to collect a few facts calculated to demonstrate that American locomotives were not the inferior machines the London *Engineer* was pleased to say they were. The facts were published in an article headed "Durability of American Locomotives," which appeared in our November number. In the article no attempt was made to appeal to prejudice or national egotism, and nothing was said reflecting on English locomotives. We merely gave particulars of the performance of locomotives on a few of our leading roads that tended to prove that American locomotives are really very durable and efficient machines. Our small article, conceived in a spirit of fraternal comity, and published in defense of a wantonly assailed machine, appears to have goaded our contemporary to fury, and it hurls a four-column reply at our devoted heads. Mildness, fairness or honesty has no place in the article. It is thoroughly characteristic of the spirit in which that paper has discussed every thing American for years.

The article opens: "Some American writers have lately been striving by help of arguments founded on very distorted statements of the facts, to prove that American locomotives are, after all, not the overworked, short-lived and extravagant machines that every one out of America believes them to be; and that American railroads have really the heaviest traffic, and are the most efficiently and economically administered lines in the world. We only wonder that these writers do not further show their ignorance of the subject by alleging that American trains are faster and safer than any others, and that American railroads have the soundest and most honest systems of finance."

Having by this introduction shown that its foot is on its native heath, and that it is ready to use innuendo where argument is lacking, the *Engineer* proceeds to abuse the Boston & Albany locomotive that made 175,000 miles in twenty-seven months, and makes out that the engine was very inefficient indeed. A great boast is made about a Great Western Railway engine that ran 94,000 miles between repairs, but a case we mentioned of a Pennsylvania Railroad locomotive that ran 251,552 miles without being off her wheels is carefully ignored. In struggling through the wilderness of bad comparative records for English locomotives, the *Engineer* happily stumbled upon a report of the Boston & Maine Railroad, and the joy expressed over the treasure knows no bounds, for the report actually showed that every locomotive belonging to the company had received more or less repairs during the year. This the *Engineer* assumes is calculated to throw cold water on the NATIONAL CAR AND LOCOMOTIVE BUILDER. We confess that the Boston & Maine makes an indifferent showing compared to many American roads, but let us see how the expense of locomotive repairs compares with some English railways our contemporary holds up as chosen examples. According to very careful calculations made by Mr. E. B. Dorsey, C. E., and made public in a paper lately read before the American Society of Civil Engineers, the expenses for repairing the locomotives of the Boston & Maine Railroad were less than half the expenses incurred for repairs of Great Western Railway locomotives.

In collecting data for his paper, Mr. Dorsey obtained confidential returns from English railway companies, and the facts he brings out regarding the expense of operating English and American railways are unquestionably correct; but in many cases they were matter of the greatest surprise to the author. This was particularly true in regard to repairs and renewals of locomotives. Like most American civil engineers, he had been accustomed so long to having Englishmen characterize our locomotives as flimsy and inclined to shake to pieces, that he believed the statement; and when the solid English locomotive was pointed to, he concluded it must be the most durable engine.

Then, again, the English roadbed is so smooth that the rolling stock ought to need little repairs, but when Mr. Dorsey got down to incontrovertible figures, he was forcibly convinced that the average cost of repairs and renewals of locomotives on fourteen railways in England came to 7.8 per cent. of the total operating expenses, while on eight American railroads it was 5.7 per cent., or one-third less. This goes to show that the American engine does not wriggle itself to pieces so readily as Englishmen are prone to make believe. As labor is the chief expense in railroad repairs, the wages in the United States should be reduced 50 per cent. to put the above comparison upon its merits, which gives 4.3 per cent. for American locomotives against 7.8 per cent. for English.

After gloating complacently over the fact that all the locomotives belonging to the Boston & Maine road underwent repairs during a year, our contemporary proceeds to demonstrate how on general principles an English locomotive must need fewer repairs than one of American make. It says all the working parts of an English engine are larger and stronger than the same parts of an American locomotive, and the parts are more substantially put together. Then follows remarks about details of American locomotives which indicate that the writer knows nothing about modern American locomotives. His strictures are directed at a style of locomotive common enough twenty years ago, but which now no more represents American practice, than the old Hawthorn engine, with driving wheels in front, represents English practice.

We admit that the English locomotive is more ponderous for the same cylinder than American engines of similar power, but we do not admit that the increase of material represents superior durability. Englishmen are continually finding the fault with American machinery that it is too light, but American designers take special pains to put the material where it is needed, with the result that the lighter machine outwears the heavier one. Even English engineers are beginning to admit that American bridge builders produce a light structure, better adapted for its work than the ponderous English bridge; and those not blinded by national prejudice admire American machine tools that are so light as to appear flimsy, yet are known to be thoroughly efficient and durable. It is the same principle applied in designing the scientific distribution of material to meet the strains of service that makes the light American locomotive do its work with half the repairs called for by the ponderous English engine.

Now let us examine the assertion that every one out of America believes the American locomotive to be an overworked, short-lived and extravagant machine. The railways in the British colonies and in Brazil, Peru and other countries have been built to a great extent with British capital, and British influence has been supreme in selecting the machinery to be used. All the sentiments of self-interest, patriotism and national prejudice favored the exclusive use of British machinery, yet we find that in spite of these aids and comfort to its rivals, the American locomotive has obtained a firm foothold in the land of its natural enemies, and is every year increasing its popularity and prestige.

We have learned that within a year, through patriotic motives, the Minister of Public Works, of New Zealand, ordered twelve locomotives from an English maker, but specified that they should be of the American type. Does that indicate that the *Engineer's* prejudice against the engine is wide-spread? The makers blundered so badly over the construction of the locomotives called for in this order, that the colonial government had to reject the engines and order substitutes from an American firm.

There is good reason for believing that the substantial English locomotive, with its many and ample bearings, expends a very high percentage of work in overcoming internal resistances. A well-known colonial engineer, some time ago, in reporting on different classes of rolling-stock, said: "The English engine is a very heavy affair, and in running it not only wears and tears itself very rapidly, but also the roadway, and greatly, by its unsteadiness and jar, fatigues the engine driver and fireman." Corroboratory evidence that the English locomotive wastes a great deal of its power in overcoming internal resistances, has been furnished everywhere when English and American locomotives have been pitted against each other. A public trial of a Hawthorn locomotive, with cylinders $16\frac{1}{2} \times 24$ in. and driving wheels 54 in. diameter, and a Rogers engine with cylinders $16 \times 24$ in., driving wheels 54 in. diameter, was made on a New Zealand railway, and the Rogers engine pulled one-third more of a load up a grade of 1 in 168 than its English competitor. This experience is repeated in Peru and other countries where the engines work side by side. The goods engine, whose performance Mr. Stroudley described in his paper on Locomotive Engines, read at the Institute of Civil Engineers, put a power of 14 pounds per gross ton into moving engine and train, at a speed of five miles per hour. An American locomotive would have moved itself and train with half the power.

The *Engineer* asserts that the reason the English locomotives were unsuccessful on the Grand Trunk Railway, was that the engines were built by an inexperienced firm. Is it for the same reason that all other Canadian roads let the English type of locomotive so severely alone? When Mr. Robinson took charge of the locomotive department of the Great Western of Canada, he brought all his prejudices in favor of English locomotives. He found that all the locomotives of the American type belonging to the company were at work, but that a good many English engines were laid up to rest and rust. That he at once directed changed. As he expressed it, "He did not believe in keeping the best engines idle and running the scraps." So the English engines were all put to work, but all Mr. Robinson's kindness toward them could not keep his favorites on the road when they had to make their record against American locomotives. Before he was two years in charge, Mr. Robinson was ready to change the English engines to the American style.

The *Engineer* and other fool friends may keep convincing English locomotive makers that American locomotives are badly designed, made of inferior material and defectively put together, and that the people who prefer them are fools, knaves, or overpowered by bad political influence. But this gratifying information will not alter the fact that the same British locomotive makers are being crowded out of their own markets by the so-called inferior American locomotive. It is a very sagacious axiom of trade that recommends supplying a customer with what he wants. British manufacturers have suffered grievously in many instances by trying to teach their customers the proper character of their needs. There is no reason why British locomotive builders should not be supplying Canada with the greater part of the new locomotives for its railways, except that under the advice of the *Engineer* and others of similar kidney, the sellers pretended to be wiser than the buyers, and acted accordingly. They received their reward, and similar treatment will be given to their successors in other markets unless they become wiser in their generation.

## WATER FOR LOCOMOTIVE BOILERS.

In some parts of the New England and Southern States, the fire-box of a locomotive lasts about as long as the boiler, and the tubes last fifteen or twenty years, and only require renewal owing to the wear resulting from the attrition of cinders. In some parts of the middle and Western States, a fire-box is worn out with a mileage under 100,000 miles, and the tubes have to be removed every six or nine months. The difference in the wear of fire-boxes and tubes in the different regions is due entirely to the character of the feed water. Where the feed water is heavily charged with lime salts, the solid matter is precipitated as the water is evaporated into steam, and forms on the heating surfaces in the shape of scale or mud. The scale being an indifferent conductor of heat prevents the water from abstracting the heat quickly from the fire-box sheets, with the result that the latter are kept at a high temperature and get destroyed by process of slow burning. It is probable that in many instances the high temperature the sheets reach through being coated with mud or scale, enables the sulphur or other hardners present in the coal to combine with the metal, changing its character and leading to damage by cracking. There are impurities found in some water that have a strongly corrosive action and destroy boilers and fire-boxes by pitting and furrowing, but water of this character is rarely met with, and the great trouble that railroad companies have to contend against is lime in its various forms.

In the early days of the Railway Master Mechanics' Association, the subject of feed water was grappled, with a determination to find means of precipitating the lime before it went into the boiler. Various methods of doctoring the water with chemicals were tried, and considerable money was expended in making experiments, but the outcome of the matter was the convincing of most of the members that the processes of doctoring were more expensive than renewing fire-boxes and tubes, without being sure remedies of lime disorders. After laborious, protracted and careful investigation, the greater part of the master mechanics came to the conclusion that getting soft surface water instead of the lime-charged well water was the only remedy.

Some of the roads were unable to obtain surface water without incurring enormous expense, and most of these resorted to mechanical means of separating the lime from the water. The most successful device of this kind was introduced by the late Mr. S. J. Hayes, of the Illinois Central Railroad. The locomotive to which this water purifier was applied had to have two domes, the forward one being used as the purifier. The dome was filled to the ring with scrap iron supported on a grating placed at the bottom. The feed water was admitted on the top of this mass of iron, which, of course, was heated to the temperature of the steam. In practice, this scrap retained a considerable proportion of the lime salts that entered with the feed water. The scrap had to be taken out and cleaned frequently. This system is still in use on the Illinois Central, but it entails great expense and labor, and they are yearly making new arrangements for getting surface water, and expect by the time this season's improvements are completed to dispense with the water purifier altogether.

We believe that most of the railroads traversing the calcareous districts, and still compelled to use well water, could effect material improvement by selecting the best well water, and rejecting that which is found to be eminently bad. On ordinary divisions, the character of the well water varies to a surprising extent. In a report made to Mr. Ives, President of the Burlington, Cedar Rapids & Northern Railway, lately, by Mr. J. White, Superintendent of Water Supply, respecting the water used on the Pacific division of that road, it is shown that the well water varies from 11 grains to 140 grains of solid matter to the gallon. These are extremes, but it may happen that the engineers habitually pass the tank that has good water, and fill up where it is particularly bad. The locomotives running light trains can always pass a tank or two, and if the engineers were compelled to avoid the bad water and fill up at the points of comparatively pure supply, it would make an enormous difference in the amount of sheet destroyers entering the boiler. There are few lines of improvement that would pay better than this. Any railroad company could have its water supply analyzed at small expense. If that were done, and notices marked conspicuously on the water tanks indicating the character of the water, there ought to be no difficulty in having the bad water habitually avoided.

## SUBURBAN CARS AND TRAFFIC.

The increase of population within a radius of twenty miles around large cities has developed a local traffic that has become a distinct branch of passenger service as respects engines, cars, rates of fare and management. The demand is for cheap and rapid transit, for which special provision has to be made. Low fares and frequent trains were not found to be remunerative in former times and for long distances, but for a numerous and increasing suburban population, these facilities have proved to be not only a source of present profit, but a guarantee of increased business in the future. This is forcibly illustrated by the working of the rapid transit problem in the city of New York. Although the traffic of the elevated roads is not strictly suburban, the same elements of growth are involved in it that exist in the immediate vicinity of other large and thriving cities. The success of suburban passenger business depends, with respect to its management, upon its strict adaptation to the wants of the people living along the lines of road. The time and cost of transit must determine how far people can afford to live from a city, and attend to their business every day in the city. It is this consideration which necessitates a marked distinction between suburban and ordinary passenger traffic. In respect to the latter, there is a rigidity in the matter of rates, even in war times, when there is a new "cut" every few days. What we mean is, that passengers can not be discriminated, and classed, and pitched in like freight for what each person can afford to pay, at times when there is no rush and the trains are running on schedule with a third or one-half the seats empty. This results from the radical distinction between persons and things, and although this distinction can not in the nature of the case be entirely obliterated, it can to a certain extent be modified to suit the requirements of suburban traffic. The rates of fare per mile should, if possible, be made more flexible by devising more equitable systems of commutation, so that a person who takes a greater number of rides would pay less per mile that one who takes a smaller number within a given period of time. This would tend to secure a larger amount of business than can be obtained by a rigid system of rates adapted to through or long trip traffic.

As regards the question as to what style of suburban cars is the best, it may be said that a distinct type is gradually being developed, differing in some important particulars from the ordinary passenger coach. A lighter weight would of course be desirable, but it is difficult to see what advantage there is in a lighter construction, so long as the average weight of load is not less, but if any thing, rather more, than is carried in other cars. The essential feature in suburban cars is the arrangement of the seats so as to provide for quicker exit and the making of shorter stops. For this purpose, no better plan can be devised than side seats at the ends of the cars and cross seats in the middle. The latter are, of course, preferred by most people, especially if they are reversible so the occupants can ride facing forward; but although the side seats are less agreeable, passengers who wish to get out easily and quickly soon learn to take them in preference to the middle seats. The cane seating now universally used in these cars is found to be much better than plush. It is more durable and cleanly, and can be easily washed and kept free from dust and vermin.

As every thing must be subordinated as far as practicable to quick exit and short stops, the width of the doors and the way in which they are opened and closed are of

importance. In cars of standard gauge the limit of width cannot be materially increased, but the facility of exit can be very much promoted by the use of sliding instead of swinging doors. This has become so obvious on the elevated lines of New York that the new cars all have sliding doors, the convenience of which is appreciated both by passengers and brakemen. It has been suggested that side doors, after the English fashion, would enable passengers to get out still more easily and quickly. But it is safe to say that such an innovation will never be made, even in our suburban cars where it would seem to afford some advantages, but which would be more than offset by interfering with the present admirable seating arrangement and weakening the side framing of the car body.

As to the length of trains, experience in the traffic is likely to demonstrate that comparatively short trains, say an average of six cars, are the most easily handled and the most profitable. Unless the tickets can be collected before the passengers enter the cars, more than one conductor would be required for longer trains, the station platforms would have to be longer, heavier engines would be necessary, and the length of stops increased to some extent.

Suburban trains have been running for some years in the vicinity of Boston, Chicago and other cities, and their number increases every year. The Boston & Albany road, some five years ago, had ten cars built expressly for this traffic, and for short trains of from four to six cars. These cars are 55 feet in length, weigh 42,000 pounds with 42-inch wheels, and have side seats at the ends and reversible ones in the middle. The length of the trips varies from 12 to 21 miles. The shorter trips are made in 35 minutes, including 13 stops, averaging one minute each. Each car is lighted with ten lamps with large Oxford burners. They are placed five on a side at the base of the monitor roof, and give light enough to enable passengers to read in every part of the car. The windows are large and admit abundance of light in the daytime.

## THE SOUTHWESTERN RAILROAD STRIKE.

In the whole history of trouble between capital and labor it would be difficult to point to a case where workmen put themselves more thoroughly in the wrong than have the strikers on the Gould Southwestern roads. Because the receiver of the Texas & Pacific Railway discharged the foreman of a car shop and refused to reinstate him, the Knights of Labor ordered all the men, not only on that road, but on the Missouri Pacific Railroad also, out on strike. Owing to a personal difficulty with one man, the territory depending on 6,000 miles of railroad has its business paralyzed. Behavior of this kind is calculated to stir up public sentiment against workmen, no matter what their wrongs or grievances may be.

While entertaining no sympathy whatever with the action of the strikers on the Southwestern roads, we cannot disguise the fact that profound discontent is widespread among the trainmen and shop workmen on the Gould Southwestern roads. There appears to be entire absence of sympathy between the men and those placed over them. In the mechanical department a system has been introduced which makes the master car-builders and master mechanics subordinate to the division superintendents. Officers who are working under this system say that the division superintendents have no understanding of rights the men claim, and when a dispute arises the panacea of discharge is ordered as a prompt settlement of all troubles. Since the change was made taking away the position of superintendent of motive power, its duties and responsibilities, the grievances of the men have been growing very rapidly, and the great strike is reputed to be a wild protest against accumulated injustice. The Knights of Labor may be a strong organization, but we are satisfied they could not get men to turn out from such roads as the New York Central, the Chicago & Northwestern, or any other of the many roads where men are fairly treated, because one man had trouble with his superintendent. Putting the mechanical department of railroads under superintendents who do not understand anything about the details of mechanical work, has never worked well, but it has never worked so deplorably as on the Gould Southwestern roads. Expenses are cut down to their lowest possible figures, and the ignorance of superintendents respecting the mechanical work they insist on interfering with, leads to waste of money uselessly, and it has to be made up by cutting time or wages. Those who are best able to judge of the real troubles on the roads mentioned, say there will never be peace between employer and employé till a common sense system of management is returned to.

## MAHOGANY FOR OUTSIDE CONSTRUCTION.

The use of mahogany as a material for the outside of passenger cars is significant of the luxurious tendencies of the age. That it will ever come into general use for this kind of construction is not probable, but quite a number of high-class cars have already been built in this way. It is usually considered fitting and in good taste to have the inside of a house, and especially the furniture, made of finer and more costly material than is used for the outside of the structure. In former times mahogany was considered quite good enough for parlor furniture, and it was especially prized because its beauty increased with its age. It was put where it would not be liable to rough usage or to be worn out prematurely. Nobody thought of putting mahogany siding on a house or barn to make the building handsomer as it grew older.

As regards houses and cars, the latter are the most affected by wear and tear of service and exposure to the weather. Why should the outside of a passenger car, exposed as it is almost constantly to smoke, dust, cinders and other deteriorating influences, be made of mahogany, and the inside also of the same material instead of something better? There may be a kind of harmony in having the inside and outside alike, but it is harmony misapplied and misplaced. A mahogany cottage, nicely varnished and kept bright by frequent washing, would look well, aside from the unfitness of the thing. But this can hardly be said of cars, because when running they move so fast that close outside inspection is impossible, and when they are in a trackyard or under a station roof, they can not be seen to any advantage. The hurry, bustle and noise at a terminal or other large station are not favorable for the contemplation of the beauties of mahogany side-panels and letter-boards. These would look just as well if they were made of more common and less costly woods, and the use of them would at the same time help to stave off a mahogany famine, which may come before long if we get in the way of using the precious material too lavishly.

## LOCOMOTIVE DAMPERS.

During a discussion on locomotives, at the British Institution of Civil Engineers, in London, lately, Mr. Worsdell, a well-known locomotive superintendent, said that in the United States locomotives were equipped with two dampers, but that the engine drivers generally ran with the front damper closed. Mr. Worsdell was for several years on the Pennsylvania Railroad, and his word is usually received as reliable authority in Britain on mechanical matters pertaining to America; but in this instance we are sure he is mistaken, although it would be fortunate if the practice he alluded to was generally followed. On parts of the Pennsylvania Railroad, where the premium fuel system is in vogue, the practice of running with the front damper closed may be common, but on other roads it is doubtful if two per cent. of the engineers think of closing the front damper. The notable exceptions to this are roads such as the Milwaukee & Lake Shore, where the enginemen are held in close and intelligent control, and are required to use all approved means of saving fuel and preserving fire-boxes.

To test how far the dampers are attended to in running, the writer went one day to the Grand Crossing, a point near Chicago where a great many trains pass hourly, and watched how the dampers of the locomotives were set. As all trains stop for the crossing, there was not much difficulty in observing the position of the front dampers. The air reservoir in many cases prevented the position of the back damper from being ascertained. Out of thirty-five locomotives, two were missed and two front dampers were found closed. The others were all open. In a great many instances the engines were blowing off steam fiercely, but there appeared to be extremely little effort made to prevent that loss of heat by closing the dampers.

On the average road there is absolutely no sentiment regarding restraining the action of the fire by closing the dampers. This is surprising in a country where the heating stove is universally used, for it might be supposed that the practice of regulating the heat of the stove by dampers would lead to the same course with the fire of a locomotive, but it seems to exert no influence. The practice of running with the dampers open in season and out of season is responsible for an enormous loss of heat with our locomotives; but there will be no radical change till better appliances are provided for operating the dampers, and until the men are instructed that closing the openings of the ash-pan restrains the draft in the locomotive fire-box, just as effectually as closing the dampers of a base-burner prevents a room from getting overheated.

## RAILROAD ECONOMY.

The present condition of railroad property and the prevailing low rates of transportation are a powerful stimulus to railroad economy. Managers, superintendents, and the heads of mechanical departments are bent upon ferreting out every leak in the way of unnecessary expenditure, in order to increase the earnings, or perhaps create a margin for still lower rates for classes of freight that can not be otherwise obtained. This necessity for economy, it is safe to say, will never cease to exist, and if anybody expects that the time is near at hand when railroad managers will be able to work their lines at an absolute maximum of efficiency and minimum of expenditure, the expectation will not be realized. Too many things have got to be learned by investigation and experience, and they can only be learned little by little.

We would not underrate the importance of a saving economy in small things as being essential to the success of any business, and especially as it affects the prosperous working of the vast and complicated system of railroads in this country. But in looking at the subject from another point of view, it seems very much like saving at the spigot, to keep such a sharp watch upon the minor details of expenditure, and overlook the errors and shortsightedness of the general management in respect to the traffic. What is the use, it may be asked, of keeping up an incessant microscopic scrutiny of the ten thousand mechanical sources of wear and waste, the excess of dead weight in castings, rods, bolts, sills, etc., the quantity of water evaporated per pound of coal, the excess of fuel consumed per mile by one locomotive more than another, with the view of ascertaining the precise line between economy and waste—what is the use, it may be said, of all this, if the substantial benefits are to be thrown away, as they have been time and again, in waging a ruinous war of rates, by which millions of revenue that would otherwise have been earned have been sacrificed with a reckless prodigality as injurious to business interests generally as it is demoralizing to railroad management.

We hold that economy of the minute, hair-splitting kind is time and labor wasted, unless what is saved is made to help the business of the roads and advance their prosperity as money making enterprises. Rate wars are a mutual cutting of throats to see which jugular will be emptied the quickest. The public naturally enjoy these periodical combats on account of the cheap rates they bring, although it is obvious that the more business the roads do at such rates the poorer they are. The average shipper or traveler cares little for this unless he happens to be a holder of the securities affected thereby. When dividend day comes round he begins to suspect something is wrong, but has little idea of the multitude of small economies that have been practiced in the operating and mechanical departments to help diminish the losses incurred by rate cutting and war.

## Mertsheimer Water and Grease Trap for Westinghouse Brake.

The very simple and ingenious device illustrated in the March CAR AND LOCOMOTIVE BUILDER for trapping grease and water out of the Westinghouse air pump, is the invention of Mr. F. Mertzheimer, master mechanic of the Union Pacific Railway, at Denver, and is covered by letters patent. Several of the traps are in use on locomotives belonging to the Union Pacific Railway, and they are highly spoken of for the efficient way they work. We should expect the device would be even more useful where moisture is more abundant than it is along the line of this road.

A WRITER in *Sechrist's Railway Equipment and Mileage Guide* thinks that the mileage of each individual wheel in freight service should be ascertained and reported as the true basis for purchasing, inasmuch as such wheels are usually bought upon a mileage guarantee. This plan, he says, should be thoroughly discussed at the next meeting of the Car Accountants' Association, and some system devised by which every road could tell at a moment's notice the mileage made by any wheel in freight or passenger service. It would be highly satisfactory, no doubt, both to the makers and users of wheels, if this plan could be carried into effect, but it is much easier to say what ought to be done than it is to point out a practicable way of doing it. So far as passenger car wheels are concerned, the keeping of an individual mileage record is easy enough. The Lake Shore road has kept such a record for many years, showing the particulars of the performance of each wheel. But to apply the same method to 5,000,000 freight car wheels, a large proportion of which run long distances upon lines to which they do not belong, is another matter altogether, and manifestly impracticable, except by an organization involving so much detail, expense and complication as to outweigh the advantages to be derived from it. It must also be borne in mind that if the actual mileage of each wheel could be ascertained, it would not be a perfectly reliable measure of comparative service, one wheel with another, unless the weight of load carried, speed of trains, and other conditions of lesser importance, be taken into account. This subject has been "thoroughly discussed" time and again at car-builders' meetings without any practical outcome in the shape of an individual mileage system.

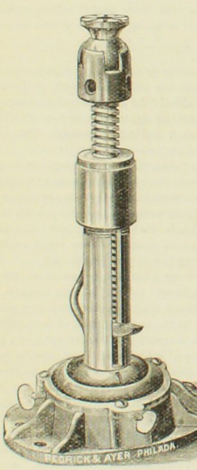
*Proceedings of the Third Annual Convention of the Roadmasters' Association.*—The report of the proceedings of this association, in convention at Chicago in October last, has been published by the Railway Age Publishing Company. The mechanical part of the report is got out in good shape, and bears the traces of careful work. The only objection we see to the report is that it contains no index, which is a serious omission for a publication of the kind. There is a very interesting discussion on frogs and switches, which well repays reading, for the men taking part are about the best authorities on the subject to be found in the country. A committee investigated the subject of "weights and form of rail with joint." They recommended 60 pounds per yard as a light rail and 70 pounds for heavy traffic. The form of section recommended has a base equal to the height, and the radius of the top of the rail to be the same as the fillet of the wheel, ½ inch preferred. They could not agree upon a joint. There was an interesting discussion on switches, and another on ballast for track. The report shows the association to be in a vigorous and flourishing condition,

## The Master Car-Builders' Club.

We print elsewhere a report of the March meeting of this Club, the special object of which was to obtain an expression of the views of the members in attendance upon sundry questions, which had been received in writing, in response to a request to that effect in the invitation card sent out by the committee in charge of the rooms. The questions related to various points in car construction upon which information was wanted, and which was likely to be elicited by discussion. But, as appears from the report, the questions were not discussed at all, except in a very brief, irregular and hap-hazard way, very much as if the speakers had met by chance on a street corner, instead of being called together by formal notice to hold a regular monthly meeting for the consideration of practical questions in a practical manner.

In much that is said at these meetings, the speakers do not seem to be aware that a shorthand reporter is employed to make a verbatim report of the proceedings, and that the report is expected to be printed in the railroad papers to be read and scrutinized by railroad men. The reporter's transcript of his verbatim notes has to be pruned, before being put in type, of what is irrelevant, trifling and merely conversational, and after the trivialities, repetitions, stale platitudes and jests have been weeded out, it often happens that the residuum of "valuable information," which it is the object of the club to disseminate, is not as large as might be wished. This is the more to be regretted for the reason that in former years, when the meetings in these rooms were held under the auspices of the Car-Builders' Association, people came long distances to attend them, and some even now come one or two hundred miles to attend the present meetings.

We would therefore suggest whether the future usefulness of the Master Car-Builders' Club would not be promoted if the discussions at its meetings were a little less informal and conversational than they have been of late, and if those who take part in them would come a little better prepared to express their views with clearness and precision. We are aware that the meetings are understood to be of a semi-social kind, or, as expressed in the invitation cards, "business and social." But the two factors should be kept distinct as much as possible, instead of being mingled together in such a way that the reporter is puzzled to tell which is which. The meetings are not supposed to be held for the mere social diversion of those who happen to be present, with no reference to the outside world, and especially the railroad world. The sociability should precede the business, an hour or so being devoted to the former, and the rest of the evening to the latter, with no time at all, during the business sessions, for sparring matches and the bandying of personalities between rival parties interested in patented inventions. The growth and influence of the Club will in our judgment be promoted by its taking a new departure that will enable it to catch up during the next season with Boston and—we were about to say Chicago; but perhaps it may be as well not to say it.

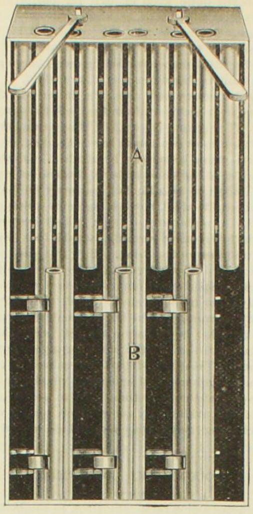


Suckow's Patent Extension Jack.

This jack differs from other screw jacks by having a ball and socket joint at base and at top of screw. The ball bearing at the base allows the body of jack to gyrate in any direction to an angle of about 30°. The ball at bottom is held by two screws, one fitting in a groove in the ball, the other clamping the body of same, making the jack stiff and solid in any desired position, and, at the will of the operator, can be loosened and made a complete carrying jack. Another advantage of the ball bearings is that the jack, bearing and load can be in almost any position, allowing the screw to work free without packing strips or wedges to give equal bearings. It is made with or without the projecting foot at bottom of screw. The screw is cast steel, with threads cut in lathe. The shape of thread is ½ V. This thread works in a bronze nut. The base of jack is strong and heavily ribbed—size, 15" by 8½". For wrecking purposes this jack is unequaled and will be found valuable for any other purposes for which a jack is required. It is made of the best material and in the best manner and will stand rough usage.

Height of jack when down, 27¼ in.; rise of screw, 9½ in.; diameter of screw, 3 in.; weight of jack, 80 lbs.; capacity, 50 tons; raise of foot, 9½ in.

Manufactured by Pedrick & Ayer, proprietors of the L. B. Flanders Machine Works, Philadelphia, Pa.




Improved Locomotive Grate.

The above cut shows grate shut in Section A and open in Section B. The levers shown in cut extend up into the cab of engine, and the remarkable fact remains that the grate can be cleaned while running at the highest speed, and yet be kept perfectly clear of clinkers. The long bars in grate are Water Bars, the short ones Rocking Bars; both being hollow, they naturally resist burning or warping. We claim a saving in fuel of 35 per cent., not considering the great economy on the flues and engine proper, and further that this is the only grate that will clean a locomotive successfully while running. This grate can be used with or without water bars on locomotives, likewise on stationary engines, furnaces and ranges of all kinds, and is now in preferable use on the Lehigh Valley Railroad, and unreservedly indorsed by them. This grate will pay for itself in 30 days and last for years. It is the only grate known that will burn hard coal, soft coal, culm or dust without changing bars.

BETHLEHEM, Pa., Feb. 8, 1886.

*James Reagan, Esq., Vice-President American Water Bar Grate Co.:*

DEAR SIR In regard to the grates in use by us on our locomotives, Nos. 141 and 142, I would say that they are built under the Swallow patents, now owned by your company, and our Mr. Mitchell, Superintendent of Wyoming Division, writes me that they are giving good satisfaction, and having been in use for several months, they have not changed their form. Further, he says that they are very convenient, saving time and labor in cleaning the fire. He intends putting them in three new boilers which he is now building, and considers them a good device. You are at liberty to show this letter if you so desire.

H. STANLEY GOODWIN,
*Gen. Supt. Lehigh Valley Railroad Co.*

MAUCH CHUNK, PA., Feb. 14, 1886.

*Vice-President American Water Bar Grate Co:*

DEAR SIR: I received your letter, but have been out so much on the road, day and night, that I have not had time to answer it sooner. Now, in regard to the bars, I have not had any thing done to them yet, and they are apparently as good as when put in, and that has been one year of constant use, making a run of 90 miles every day, and making about two extra trips a week, or about 750 miles a week; and I must say they are the best grates I have ever seen, as they are a saving in fuel and labor, and also ash pans, as when a fireman cleaned a fire the old way with a hook or poker he generally knocked out a foot of the front end of his fire, and before he got a chance to clean out the pans they were red hot, and that would cause them to warp. Whereas now, he only shakes out the dead stuff, or ashes, as you would term it. So, in my estimation, they are a great saving all around. I now have a fireman who uses them as they should be used, and he saves from a ton to a ton and a quarter of coal a trip, and also a great saving of time, and that, you know, is an important thing nowadays.

ALBERT DE GROTE,
*Engineer 272, L. & S. Div. Phil. & Reading R. R.*

## Railroad Association Meetings.

April 15.—Association of Railroad Superintendents, at Cincinnati.

June 8.—Master Car-Builders' Association, at Niagara Falls.

June 15.—Railway Master Mechanics' Association, at Boston.

Sept. 8.—Master Car and Locomotive Painters' Association, at Chicago.

THE CUMMER ENGINE CO., Cleveland, O., have orders for a 215 h. p. engine for the Peninsular Car Works, and a 55 h. p. engine for the Cleveland Machine Co. The company have shipped a 170 h. p. engine to G. W. Straight, Chicago, and are designing patterns for the "Simplex" automatic engine, patented April, 1885, and to be built in sizes from 15 to 20 h. p. This engine is said to have fewer parts than any other small engine in the market, has been practically tested, showing great economy in steam consumption and an effective power ninety per cent. more than the indicated power. The company have the sole right of manufacture, and are putting in special machinery for building them on an extensive scale.

THE ACME MACHINERY CO., Cleveland, O., have issued a new descriptive catalogue and price list, containing numerous illustrations of their "Acme" single and double bolt cutters, nut tappers, pointers, surface grinders, etc. Detailed directions are given to guide purchasers of these machines in obtaining those that will do accurate work, and also in the making and repairing of dies, so as to produce first-class threads. The superior advantages of the "Acme" head are pointed out, also the imperfections of the numerous threading and tapping machines in use, the threads not being clean cut, but only ridges squeezed on the iron, and the number of threads to the inch a matter of uncertainty.

THE PERFECTED BAKER CAR HEATER.—The details of this method of heating are very fully illustrated and described in a second edition pamphlet just issued by the Baker Heater Co., of New York, who are the sole proprietors and manufacturers of the improved form of heater recently introduced by Mr. W. C. Baker. The "Perfected Heater" embodies 18 distinct improvements upon the original Baker Heater, each one of which is set forth in detail, and in a way to be readily understood by car-builders and others interested in the subject. The pamphlet is printed in attractive style, the engravings well executed, and the contents as a whole are worthy of careful perusal.

THE PENFIELD BLOCK CO., of Lockport, N. Y., has issued a new illustrated catalogue and price list of its "Anchor" brand, wood and wrought iron tackle blocks, store and warehouse trucks, carpenters' mallets, patent iron sheaves, the "Lockport" pattern hoisting snatch block, West's patent lock faucet, the giant car pusher, and a special cargo hoisting block not heretofore listed. Reference is made to the company's catalogue for 1884, which contains many patterns and sizes, together with telegraph cipher key, not comprised in the new catalogue.

BEAUDRY & CUNNINGHAM, of Boston, Mass., have recently booked orders for Upright Cushioned Power Hammers, as follows: One 300 pound for Colwell Iron Works, New York; one 50 pound for Granite Hames Works, Sunapee, N. H.; and one 50 pound for Easton & Burnham, Spindle Manufacturers, Pawtucket, R. I.

THE Van Dusen Nut Locks are being used on the Kentucky & Indiana Bridge, and on the approaches and track. Mr. John McLeod, Chief Engineer of the bridge, says: "I am using on the Kentucky & Indiana Bridge, approaches and track, the Van Dusen Nut Lock, manufactured by the Peerless Manufacturing Co., Louisville, Ky., and consider it the best nut lock I know of."

BYRAM & CO., Detroit, Mich., have recently shipped two of their cupolas to the Pittsburgh Car and Locomotive Works, one to Los Angeles, Cal., and one to Jackson & Woodin Mfg. Co., Berwick, Pa., making the second they have sent to the last-named company.

## Caution to Users of Planing and Molding Machines.

OFFICE OF S. A. WOODS MACHINE CO.,
172 High street,
BOSTON, Mass., March 1, 1886.

DEAR SIR: It has come to our notice that certain manufacturers of planing and molding machines are making and selling machines that contain patented improvements which are owned by us exclusively, and we desire to caution users of wood-working machinery against buying or using machines that infringe our patents. Particularly do we call attention to "fast feed" planers and heavy molders that closely resemble our own well-known machines in general appearance, for they so far employ and embody our patented devices that we have been compelled to insist upon an immediate discontinuance of several features therein used. We have given no license for their use, and any one making or using such machines does so at his own risk. Our machines have been perfected by many years' experience, and are so well and favorably known as to invite imitation from manufacturers who would seek to profit by the well-earned reputation of our machines, but when it comes to direct infringement, we must emphatically object, and shall seek to protect our rights in this matter. Believing that millmen generally, among whom we are known to some extent, will understand the justice of our claims,

We remain, yours obediently,
S. A. WOODS MACHINE CO.

## Our Directory.

We note the following changes since our last issue. Our readers will do us a great favor by giving us prompt notice of any changes that may come to their knowledge or of any errors that may be noticed in our list:

*Atlantic & Danville.*—John A. Gee, late of the Richmond & Danville, has been appointed General Superintendent.

*Boston, Hoosac Tunnel & Western.*—H. L. Morrill has resigned the office of General Manager.

*Chesapeake & Ohio.*—John N. King, Master Car-Builder of the road, was killed by being run over on the track Feb. 25.

*Chicago & Eastern Illinois.*—O. S. Lyford, heretofore General Superintendent, has been appointed General Manager.

*Delaware, Lackawanna & Western.*—W. F. Hallstead, for many years General Superintendent of the road, has been appointed General Manager.

*East Tennessee, Virginia & Georgia.*—J. B. Michael has been appointed Master Mechanic of the Alabama Division, in place of Simon Gay, transferred.

*Knox & Lincoln.*—C. C. Coombs has resigned as Superintendent, to accept a position on the Hoosac Tunnel & Western.

*Missouri Pacific.*—W. J. Rogers has been appointed Master Mechanic in charge of the shops at Kansas City, in place of W. T. New, resigned; and Samuel Weller is appointed Master Mechanic of the Sedalia shops, in place of T. W. Newell, transferred to the Missouri, Kansas & Texas Division.

*New York & Sea Beach.*—O. R. Whitney has been appointed Master Mechanic. He was recently on the West Shore road.

## Employment.

How natural it is to try to get *something* for *nothing*, and expect satisfaction in the use of materials that look well but have no real merit. This is exemplified in painting cars as much as anywhere. The Perfect Method Paints manufactured by us insure durability and saving of time otherwise lost in repainting, or loss by decay of the wood and rust of the iron when the paint has perished, as most of the ordinary paint soon does.

THE SHERWIN-WILLIAMS CO.,

CLEVELAND & CHICAGO.

Manuf'rs High Grade Paints and Colors for Railway use.

---

Established 1856.

**Shipman & Bolen,** Mfrs. of fine

**Railway Varnishes.**

Our Varnishes excel in durability,

Newark, New Jersey.

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FINEST QUALITY
FIRE BOX
AND BOILER PLATES
By the Crucible and Open-Hearth Processes.

**HUSSEY, HOWE & CO.** [Limited],

PITTSBURGH, PA.

The Oldest Manufacturers of Crucible Fire-Box Plates.

BEST QUALITY
TOOL STEEL
AND Standard Crucible Spring Steel.
Made Expressly for Railroad Use.

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GEORGE WESTINGHOUSE, JR., President. JOHN CALDWELL, Treasurer.
T. W. WELSH, Superintendent. W. W. CARD, Secretary. H. H. WESTINGHOUSE, General Agent.

# THE WESTINGHOUSE AIR BRAKE COMPANY,

PITTSBURGH, PA., U. S. A.,

MANUFACTURERS OF THE

## WESTINGHOUSE AUTOMATIC BRAKE.

The **WESTINGHOUSE AUTOMATIC BRAKE** is now in use on 15,000 engines and 125,000 cars in all parts of the world. This includes 45,000 freight cars.

The **WESTINGHOUSE AUTOMATIC BRAKE** is the only continuous brake that has been successfully used on freight trains.

*THE AUTOMATIC BRAKE* will, in consequence of its quick application, stop a train in the least possible distance.

*THE AUTOMATIC BRAKE* on freight trains, as in passenger service, applies itself instantly to all parts of the train in the event of the train breaking into two or more parts, a feature of great importance in view of the statistics published in the *Railroad Gazette*, which show conclusively that a majority of the collisions are caused by the breaking in two of trains. (See *Railroad Gazette*, Feb. 12, 1886, page 113.)

*THE AUTOMATIC BRAKE* also applies itself to every car in the train, in the event of any accident to the brake apparatus of such a nature that it would render any non-automatic continuous brake inoperative.

*THE AUTOMATIC BRAKE* can be applied from the rear or from any portion of the train, if desired.

*THE AUTOMATIC BRAKE* will effect an increase of at least twenty-five per cent. in the efficient value of freight rolling stock, owing to the quicker time that can be made on the road, and the avoiding of delay at stations and sidings. Freight trains carrying perishable goods are being daily run on passenger schedules.

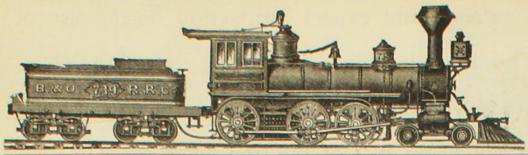
*THE AUTOMATIC BRAKE*, applied to freight cars, avoids the flattening of wheels and effects a yearly saving, in this item alone, nearly equal to the first cost of the apparatus.

*THE AUTOMATIC BRAKE* will prevent a greater part of the accidents to freight trains which form so large an item of expense in railway management.

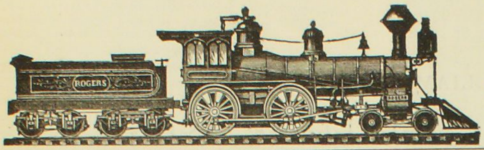
*THE AUTOMATIC BRAKE* will save employés from the danger and exposure to which they are now subjected, having to ride on the tops of cars in cold and stormy weather, and often sacrificing their lives in the discharge of their duties.

*THE AUTOMATIC BRAKE* is simple in construction and operation, and cheaply maintained, the working parts being combined in one piece of mechanism.

*THE AUTOMATIC BRAKE* is not an experiment, but is the result of many years of practical experience, and its capabilities are well known to all railway managers.

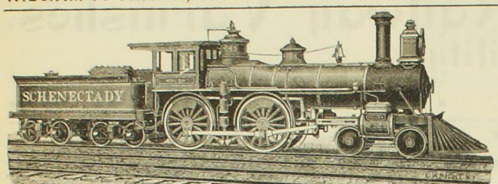



## PITTSBURGH LOCOMOTIVE AND CAR WORKS,
PITTSBURGH, PA.
MANUFACTURERS OF
Locomotive Engines for Broad or Narrow Gauge Roads,
From standard designs, or according to specifications, to suit purchasers.
Tanks, Locomotive or Stationary Boilers Furnished at Short Notice
D. A. Stewart, Prest. D. A. Wightman, Supt. Wilson Miller, Sec. & Treas.

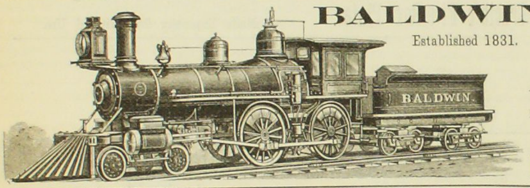



## ROGERS LOCOMOTIVE AND MACHINE WORKS,
PATERSON, N. J.
New York Office, 44 Exchange Place.
Manufacturers of Locomotive Engines and Tenders and other Railroad Machinery
J. S. ROGERS, President.
R. S. HUGHES, Secretary. } PATERSON, N. J.
WM. S. HUDSON, Sup't.
R. S. HUGHES, Treas., 44 Exchange Place, New York.

# RHODE ISLAND LOCOMOTIVE WORKS,
## PROVIDENCE, RHODE ISLAND.
EARL PHILIP MASON, Vice-President. CHARLES FELIX MASON, President. ARTHUR LIVINGSTON MASON, Secretary.
WILLIAM P. CHAPIN, Treasurer. JOSEPH LYTHGOE, Superintendent. WILLIAM H. FENNER, Jr., Agent.




## SCHENECTADY LOCOMOTIVE WORKS.
CHAS. G. ELLIS, President. EDWARD ELLIS, Treasurer.
WALTER McQUEEN, Vice-President. A. J. PITKIN, Superintendent.
SCHENECTADY, N. Y.




## BALDWIN LOCOMOTIVE WORKS.
Established 1831.
ANNUAL CAPACITY, 600.
LOCOMOTIVE ENGINES,
Adapted to every variety of service, and built accurately to standard gauges and template. Like parts of different engines of same class perfectly interchangeable.
Broad and Narrow-Gauge Locomotives; Mine Locomotives by Steam or Compressed Air; Plantation Locomotives; Noiseless Motors for Street Railways, etc.
Illustrated Catalogues furnished on application of customers.
BURNHAM, PARRY, WILLIAMS & CO., Proprietors, Philadelphia, Pa.

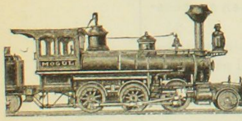
JAS. MORRISON, President. W. H. NIVEN, Vice-President. HENRY AIRD, Secretary and Treasurer. GEO. TIMMINS, General Manager.

STANDARD
HAMMERED CHARCOAL IRON
LOCOMOTIVE
BOILER TUBES.
ALL TUBES WARRANTED.

## SYRACUSE TUBE COMPANY,
SYRACUSE, N. Y.,
MANUFACTURERS OF
LAP-WELDED BOILER TUBES.

SPECIAL
SEMI-STEEL
LAP-WELDED
LOCOMOTIVE
BOILER TUBES.
ALL TUBES WARRANTED.

## H. K. PORTER & CO.,
PITTSBURGH, PA.



LIGHT LOCOMOTIVES.
All work steel-fitted and interchangeable. Duplicate parts kept in stock. Illustrated Catalogue mailed on application.

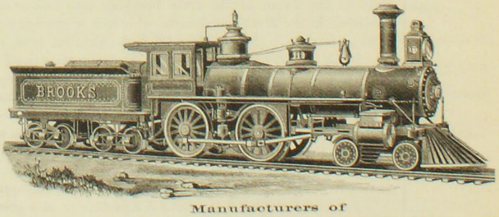
GEO. E. SACKETT, Pres. J. T. WRIGHT, Supt.

## New Albany Steam Forge,
MANUFACTURERS OF


AND


Crank Pins, Equalizers, Slide-Bars, Connecting, Parallel and Piston Rods. Heavy Forgings of all Kinds of Iron and Steel.
Office and Works, New Albany, Ind

## BROOKS LOCOMOTIVE WORKS
DUNKIRK, N. Y., U. S. A.




Manufacturers of
ALL CLASSES OF LOCOMOTIVES AND THE THURBER STEEL WHEEL.
H. G. BROOKS, President. J. H. SETCHEL, Sup't.
M. L. HINMAN, Sec'y and Treas'r. R. J. GROSS, Traveling Agent.

## EWALD IRON COMPANY,
OWNERS AND OPERATORS OF
# —TENNESSEE ROLLING WORKS.—
Tennessee Charcoal Bloom Boiler Plate, Flange, Fire Box, Sheet, Bar and Stay-Bolt Iron.
ST. LOUIS OFFICE, - - - - - 801 NORTH SECOND STREET.
MANUFACTURE CHARCOAL IRON EXCLUSIVELY.